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Kew Bulletin

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Kew Bulletin

PUBLISHED FOR THE ROYAL BOTANIC GARDENS, KEW

FORMERLY THE "BULLETIN OF MISCELLANEOUS INFORMATION"

No. 1, 1946

KEW DURING THE WAR YEARS.

Publication of the Kew Bulletin was suspended after the appearance of No. 3, 1941, which was issued in March, 1942. This is the first number to be published since that time and it is, therefore, desirable to place on record, very briefly, the more important events in the history of Kew during the intervening years.

The death of the Director, Sir Arthur Hill, on 3rd November, 1941, as the result of a riding accident in the Old Deer Park adjacent to the Gardens, was a sad loss, especially to those members of the staff who had served under him for a long period. He was appointed Assistant Director at Kew in 1907 and Director in 1922. Sir Arthur's services to Kew, and to botany in many of its branches, have already been recorded in published obituary notices.*

In November, 1941, Sir Geoffrey Evans, Economic Botanist at Kew, was appointed Acting Director and continued in charge till 1st September, 1943, when Professor (now Sir Edward) Salisbury assumed the directorship.

The Assistant Director, Mr. J. S. L. Gilmour, was seconded for service with the Ministry of Fuel and Power from 1940 to 1944. The Curator, Mr. W. M. Campbell, was seconded for a period for service with the Camouflage Department of the Ministry of Home Security, and Mr. G. H. Preston to the Ministry of Agriculture's advisory service.

Kew has fortunately not suffered severe damage as a result of the war. Some thirty high explosives fell within the premises and much glass was broken, particularly in the Temperate House, the Palm House, the North Gallery, and Museum I. The only buildings receiving a near miss were the head carter's house and the stables, but here neither the human occupants of the house nor the horses stabled nearby received any serious injuries. On the same occasion the Temperate House was severely damaged, but owing to the energies of the staff the collections suffered far less than was to have been expected. The Herbarium and Library had 121 panes of glass shattered during the night of 24th-25th September, 1940. Volunteer fire-fighting squads of members of the staff were on duty every night from 1st September, 1939, to 24th March, 1945. Except for intermittent short periods the Gardens and Museums were kept open to the public and the Herbarium and Library were never closed to visitors during the above period.

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* Nature, **148**, 619–620 (1941); Proc. Linn. Soc. Lond. 154th Session, 280–285 (1943); Journ. Kew Guild, **49**, 129–139 (1943); Obituary Notices of Fellows of the Royal Society, **4**, 87–100 (1942).

In November and December, 1940, about one-third of the Herbarium collections was moved to Oxford and stored in the basement of the New Bodleian Building by permission of Bodley's Librarian. A considerable number of the more valuable books from the Library were also sent to the New Bodleian in March, 1941, and more books and specimens in July and August, 1944. All these specimens and books were returned to Kew in October–November, 1945. The Sherardian Professor of Botany at Oxford placed rooms at Yardley Lodge at the disposal of the Kew staff. In January, 1941, rather less than another one-third of the Herbarium collections was moved to buildings in Gloucestershire (Colesbourne and Clifferdine) and travel and other books to Lypiatt Park, Gloucestershire. The rooms at Colesbourne were rented till October, 1941, when the cabinets there were moved to Daglingworth Rectory. The accommodation at Clifferdine was placed at the disposal of Kew by Sir Nigel Norman and that at Lypiatt Park by His Honour Judge Woodcock. The collections stored in Gloucestershire were returned to Kew in September, 1945. The Wallich Herbarium and some other special herbaria were stored at the Tring Museum by permission of the Director and by arrangement with the Keeper of the Department of Botany, British Museum (Natural History). The Director and staff of Kew are much indebted to all those in Oxford and Gloucestershire who, often at considerable inconvenience, made arrangements for the safe storage of the valuable collections and working accommodation for members of the Kew staff, and to the authorities of the British Museum (Natural History) for the loan of space at Tring.

Naturally, the normal work of the Herbarium and Library staff was much curtailed during the period under review. First consideration was given to protection of the collections, and this included extraction and special protection of types in addition to the evacuations recorded above. Current consultative work was kept up to date and a considerable amount of help was given to the war effort. Five members of the staff served in the Army or R.A.F., two other members were largely occupied for five years in work for the Admiralty, and one was seconded to the Foreign Office. In spite of dispersal of staff and collections a considerable amount of research was carried out and it is hoped that the results of this will be published in forthcoming numbers of the Kew Bulletin.

Members of the staff of the Museums were able to continue with their normal work without the troubles of evacuation. Various topical exhibits were staged in the Museums. The department was largely responsible for starting the collection of medicinal plants which was subsequently organized on a national scale. The vitamin C content of rose hips and of various *Juglandaceae* was surveyed. A short basketry course was carried out in conjunction with the National Federation of Women's Institutes.

At the Jodrell Laboratory the microscopical identification of plant materials was continued and included investigation of some from enemy sources. Special work included the preparation of fibre of the common nettle and experiments on other uses of nettles ; research on the rubber content of *Taraxacum kok-saghys* and on the production of pith and pegwood from elder. Fundamental work on the systematic anatomy of the Dicotyledons, commenced before the war, was continued. Research was carried out in cytology and physiology by visitors including war refugees from the continent.

Difficulties were experienced in the maintenance of the living collections through the withdrawal of the younger and more active members of the staff for military service. Their places were filled in a large measure by women, who did excellent work in almost every section of the establishment. The lawns in front of Kew Palace and other areas were devoted to the cultivation of fruit and vegetables, and demonstration allotments, cropped according to standard plans, were maintained for the benefit of the public.

Experiments were carried out on the use of the " rose ends " of potatoes for propagation in place of the normal seed which demonstrated the practicability of this method as an effective means of economising material and saving some 85 per cent. of weight so that air transport is practicable. Also crops of various drug plants such as Belladonna were cultivated with considerable success.

The following changes in the staff, additional to that of the Directorship, are recorded :

Dr. R. W. G. Dennis was appointed to the Herbarium staff as Mycologist on 1st October, 1944.

Mr. K. N. Kaul, who had been Botanist for India in the Herbarium from July, 1939, returned to India in October, 1944. Dr. D. Chatterjee took up the duties of the post on 8th May, 1946.

Dr. T. A. Sprague retired from the Deputy Keepership of the Herbarium and Library in November, 1945, and Miss E. M. Wakefield, M.A., succeeded him. Mr. A. D. Cotton retired from the Keepership on 31st January, 1946, and Dr. W. B. Turrill was appointed Keeper from 1st February.

Mr. J. S. L. Gilmour resigned his post of Assistant Director and became Director of the R.H.S. Gardens at Wisley on 1st June, 1946.

Mr. A. Osborn retired as Assistant Curator (Arboretum) in March, 1945. His work has been taken over by Mr. S. A. Pearce, and Miss E. V. Paine has been appointed Acting Assistant Curator in the Decorative Department.

REVIEW

Flora of Illinois.*—This flora consists essentially of keys to the families, genera, and species of vascular cryptogams and seed-bearing plants of Illinois, one of the states of the Great Central Plain of North America. The sequence of families is chiefly that of Engler and Diels. Two text-maps are included, one showing the botanical divisions (termed a vegetational map) and the other an outline map of the counties. Local names, flowering periods, and outlines of habitats and ranges are given for the species, or for many of them. Introduced plants that have become more or less naturalized are included. The founts used are very clear and the general production gives a pleasing impression. One criticism suggests itself to a botanist who likes to determine plants, at least tentatively, in the field. The size (9 × 6 inches) is too large for the average pocket (though American botanists may have pockets more generous than those of British utility suits) and the weight is unduly heavy through the use of rather thick glazed paper.

The original vegetation of Illinois was sharply differentiated into grassland and hardwood forest, the former mainly in the central and northern, the latter in the southern parts. The soil over much of the state is, however, very fertile, so that with the advent of colonization the surface has been very largely transformed into agricultural land. In spite of this destruction and modification of the natural plant cover, the flora is a rich one. 2,124 species of vascular plants are here recorded as growing spontaneously in Illinois, and of these 1,786 are indigenous. Trees and shrubs belong to 49 families, 111 genera, and 302 species. *Salix* has 17, *Quercus* 19, and *Crataegus* 14 species. Herbaceous plants belong to 113 families, 713 genera, and 1,822 species. *Carex*, with 114 species, is the largest genus in the flora. There are 70 genera and 215 species of grasses, of which 166 species are native, and *Panicum* (36 species) is the largest genus of *Gramineae*. *Compositae* (63 genera, 243 species) make the largest family. Vascular cryptogams (63 species) and woody plants are surprisingly high in numbers for a prairie state. These figures must still be considered tentative for, it is stated, more than half of the 102 counties of the state are almost unexplored botanically while the distribution of the " lower plants " is comparatively unknown.

Illinois has an area of 57,926 square miles and most of this has a low elevation and comparatively level surface. At least nine-tenths of the surface was glaciated during the Pleistocene Ice Period (with four advances of the ice-sheet into the state). The flora is mostly of a southern type, boreal elements being rare. Eight botanical divisions are recognized but these are based principally upon the broader topographical features, including the effects of glacial geology, rather than upon the ranges of communities and species, though, of course, there are some important correlations between topography and distribution. The correlation between glacial deposits and distribution (both local and general) should be of considerable interest if worked out in detail, because the Ozark Ridge, in the south of Illinois, was the most southerly latitude reached by the North American ice-sheet.

W. B. TURRILL.

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* By George Neville Jones. The American Midland Naturalist, Monograph No. 2, The University Press, Notre Dame, Ind. April 1945, pp. 318, 2 maps, $4 cloth bound, post paid.

A KEY TO THE CARICES OF MALAYSIA AND POLYNESIA.

E. Nelmes.

Since completing a descriptive, and publishing a preliminary, account of the Australian *Carices* (see Proc. Linn. Soc. 155 Sess., 277 : 1942–43) I have drawn up detailed descriptions of the Malaysian and Polynesian species of this genus. Following the plan adopted for the Australian *Carices*, a tentative key to the Malaysian and Polynesian ones is published here in advance of the fuller treatment.

" Malaysia " is here made to comprise the whole of Indo-China, lower Burma, the Malay Peninsula, and all the islands from Sumatra and the Philippines as far as and including New Guinea. It was at first intended to limit this work to Malaysia. On second thoughts, and for several reasons, it was decided to add the *Carices* of lower Polynesia, i.e., including most of the Pacific islands except Hawaii. For one thing, these Pacific *Carices*, though mostly specifically distinct from those of Malaysia, have their closest affinity with these and with the Australian species. It was also realised that the inclusion of Polynesia would complete the whole of the south Pacific area. Finally, the half-dozen or so *Carices* of Hawaii were brought into the Key. Though these have no close ties with the *Carices* of lower Polynesia, they have no strong relationship with those of any other area, and Hawaii is geographically a part of Polynesia.

War-time difficulties similar to those encountered in the work on the Australian *Carices* have arisen in an accentuated form in the task of working out the Malaysian and Polynesian species. Of these, Kew possesses rather fewer than half the types, and these have been the only ones available. I have, however, been able to examine the remainder of the Kew material from this area, as well as Kew's Indian types and the rather poor representation of Chinese and Japanese types at Kew. These are the countries with which the Malaysian *Carices* have the greatest affinity. Large collections of Malaysian *Carex* material in Java and elsewhere are at present inaccessible. When these can be examined it will no doubt be necessary to extend the Key and possible to improve it.

The number of species recognised is 138, and I have included in the treatment not only those species of which I have seen specimens but also about a score which I have not been able to examine, about half of which have been described by the eminent authority on sedges, Kükenthal. This author and several others have also described varieties and forms of a few of the species, but as I have not seen specimens of the majority of these I have excluded most of them from this preliminary publication.

So far as one can indicate probable lines of descent in a linear order, the sequence of species in the enumeration follows that of the Australian one, which was based on the view that " *Carex* had a tropical and probably Malayan origin." Those species which appear to exhibit the most primitive characters, vegetatively at least and more or less florally, have elliptic to linear-elliptic leaves, which are also very much broader than the linear leaves of most of the *Carices* of other lands. These broad-leaved species, of which *C. Adrienii* E. G. Camus and *C. euprepes* Nelmes are outstanding examples, appear to be confined to Indo-China, Burma, and southern China. Just over fifty of the species belong to the subgenus

Indocarex Baill., which occurs throughout but scarcely outside the tropics, and which, *sensu lato*, contains the most primitive species, structurally, of the three subgenera into which *Carex* is often divided, and of which the above mentioned broad-leaved species are extreme types. The subgenus *Vignea* (P. Beauv.) Nees, the members of which appear to be at the other end of the evolutionary scale, and which occur most frequently in temperate countries, is represented by only eleven of the remaining eighty Malaysian and Polynesian species, mostly on the mountains of Sumatra and Java (three of these are common British *Carices*). The remaining species are placed in what one may perhaps term the "intermediate" subgenus *Eucarex* Coss. et Germ. (though it is not truly intermediate), which has a world-wide distribution but is less common in the warmer regions.

It is interesting to note, according to the enumeration, how the early species, both in the list and in time, still largely inhabit the home of their ancestors, and how, as one goes through the enumeration, Indo-China and Siam occur less and less, and the more eastern and southern areas of the Philippines and Polynesia become more and more frequent. This picture of the evolution of *Carex* in time and in space would be still more impressive if altitude were taken into consideration, as it is hoped to do in the subsequent fuller account.

One could explain at considerable length the problems that have arisen concerning the delimitation of the species as presented in the Key, but that would make this introductory matter disproportionate to the brief treatment following it. Besides, it is hoped that many present problems will be solved in the examination of more ample material, and some decisions will be reversed or at least modified.

KEY

Spike 1, terminating the stem :

Spike 2–3 cm. long, 3–4 mm. thick ; utricles 5–6 mm. long . . . . . 54. *Petelotii.*

Spike 5–12 mm. long, 4–6 mm. thick ; utricles 2·5–3 mm. long . . . 55. *capillacea.*

Spikes more than 1 on a stem :

A. Terminal and most of the other numerous spikes wholly pistillate, a few smaller ones staminate (a very tall plant with a regularly and extremely leafy stem) . . . . 5. *hypolytroides.*

A′. Terminal spike gynaecandrous, i.e., staminate below and pistillate above, or staminate at both ends and pistillate in the middle, never pistillate at the base (for A″ see p. 7) :

Spikes usually all, but at least the lowest, peduncled, light- to dark- or reddish-brown, 0·5–7·5 cm. long, basal staminate part usually from as long as to much longer than the pistillate part :

Stigmas 3 ; utricles compressed-trigonous to distinctly trigonous :

Utricles about 5·5 mm. long, pale green, smooth, long-beaked ; spikes 2·5–3·5 cm. long . . . . 51. *atjehensis.*

Utricles 2·25–2·5 mm. long, ferrugineous, densely papillose, extremely short-beaked ; spikes 5–18 mm. long . . . . . . 109. *elibates.*

Stigmas 2 ; utricles plano-convex or biconvex :
Spikes 3–7·5 cm. long, upper 2–4 wholly pistillate above . . . 118. *Kerrii.*
Spikes 2–4 cm. long, upper 1–3 pistillate above but with a short to long staminate portion at the apex :
Utricles rather strongly 6–10-nerved ; scales blackish-red . . . 120. *teres* var. *spathulata.*
Utricles nerveless ; scales pale with reddish streaks . . . . . . 121. *dimorpholepis.*
Spikes all sessile, light greenish, 0·5–1·5 cm. long, staminate flowers at the base usually so few that the spikes have a wholly pistillate appearance :
Inflorescence 12–15 mm. long ; spikes densely congested . . . 138. *pachystachya.*
Inflorescence 2–13 cm. long ; spikes contiguous to strongly separated :
Lower bracts in the form of enlarged, aristate scales ; inflorescence about 2–5 cm. long ; utricles not winged . 137. *curta.*
Lower bracts foliaceous ; inflorescence about 5–13 cm. long ; utricles winged on the margins :
Spikes about 6–9 ; pistillate scales 3·25–4 mm. long ; utricles 4–4·5 mm. long . . . . 136. *Rochebrunii.*
Spikes about 12–21 ; pistillate scales 2–3 mm. long ; utricles 2·75–3·3 mm. long :
Spikes ovoid to shortly cylindrical ; utricles 3–3·3 mm. long . . . . 134. *craspedotricha.*
Spikes ellipsoid-cylindrical to ellipsoid ; utricles 2·75–3 mm. long . . . . 135. *alta.*
A′′. Terminal spike wholly staminate (*C. Brownii*, *C. inverso-nervosa*, and *C. phacota* sometimes have a few pistillate flowers at about or above the middle of the terminal spike) (for A′′′ see p. 13) :
B. Flowering stems arising from the axils of basal foliage leaves . . . . 80. *multifolia.*
B′. Flowering stems arising from below the foliage leaves :
Spikes 1–2 cm. long ; lower bracts much shorter than the inflorescence . . . . 76. *pleurocaula.*[*]
Spikes 5–10 mm. long ; lower bracts longer than the inflorescence :
Leaves 2–3 mm. broad ; utricles 6–7 mm. long . . . 94. *lateralis.*
Leaves 3–7 mm. broad ; utricles 4·5–5·25 mm. long :
Stems about 5–7 cm. tall ; utricles rhomboid-lageniform . . . 77. *lageniformis.*
Stems about 15–20 cm. tall ; utricles ellipsoid . . . 92. *Elmeri.*
Leaves 16–25 mm. broad ; utricles up to 10 mm. long . . . . . 87. *Harlandii.*
B′′. Flowering stems arising from the centre of the foliage leaves and developed from the shoot on which these are borne :
Spikes densely congested into an ebracteate, terminal inflorescence 133. *flaviceps.*

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[*] **Carex pleurocaula** *Nelmes*, sp. nov. ; affinis *C. lageniformi* Nelmes, sed culmis longioribus, spicis longioribus, bracteis inferioribus inflorescentia multo brevioribus, praecipue differt. Type : *Evrard* 944. Dalat, Annam.

Spikes not densely congested, arising from bracteate nodes :

Spikes on 3 or more main peduncles from each of several nodes of the inflorescence :

Some peduncles branching into 2–6 simple spikes . 57. *javanica.*

Each peduncle bearing only 1 simple spike :

Stems 1–15 cm. tall ; leaves 2 mm. broad ; spikes 10–12 mm. long ; utricles 3 mm. long ; spikes 6–9 on each stem, 2–3 at a node . . . . 61. *celebica.*

Stems 25–75 cm. tall ; leaves 3–6 mm. broad ; spikes 1·5–5 cm. long ; utricles 4·5–6 mm. long ; spikes usually numerous, 1–20 at a node :

Leaves usually much shorter than the stems ; inflorescence 18–28 cm. long ; bracts mostly not reaching the apex of the inflorescence ; utricles 5·25–6 mm. long, glabrous except on the margins of the beak, which are sparsely hispidulous . . . 62. *hypsophila.*

Leaves often longer than the stems ; inflorescence 10–20 cm. long ; bracts all exceeding, often much exceeding, the apex of the inflorescence ; utricles 4·5–5·5 mm. long, hispidulous on the margins above and on those of the beak . . . 62a. *hypsophila* var. *Havilandii.*

Spikes solitary at each node of the inflorescence :

C. Lower bracts, often all the bracts, completely sheathing the stem (for C′ see p. 11) :

Staminate scales with margins more or less connate in front :

Margins connate for more than halfway up from the base . . . . 84. *pocilliformis.*

Margins connate for less than halfway up from the base . . . . 85. *tristachya.*

Staminate scales not connate on the margins :

D. Utricles glabrous, even on the margins of the beak : (For D′. see p. 9) :

Spikes 3–8·5 cm. long ; peduncles bristly on the angles and sides ; pistillate scales sparsely hispidulous ; beak of the utricle inflated at about the middle . . . . 101. *oedorrhampha.*

Spikes 0·5–4·5 cm. long ; peduncles smooth, or scabrid on the angles ; pistillate scales glabrous ; beak of the utricle not inflated at the middle :

Staminate scales cuneate or oblong-cuneate, with an awn as long as or longer than the rest of the scale . . . . 102. *Brownii.*

Staminate scales neither cuneate nor oblong-cuneate, when awned the awn shorter, usually very much shorter, than the rest of the scale :

Stigmas 2, stoutish; awn of pistillate scale about 1–2·25 mm. long ; utricles plano-convex, densely whitish-papillose towards the apex 117. *savaiiensis.*

Stigmas 3, slender ; pistillate scales not to very shortly (up to about 1 mm.) mucronate or awned ; utricles more or less trigonous, not whitish-papillose :

Utricles 5·5–7 mm. long, beak more than 1 mm. long ; pistillate scales 3–5 mm. long.

Leaves 4–9 mm. broad ; spikes 5–8 mm. thick when the utricles mature ; utricles 5·75–7 mm. long, strongly multinerved
91. *Jackiana.*

Leaves 2–3 mm. broad ; spikes about 3 mm. thick when the utricles mature ; utricles about 5·5 mm. long, obsoletely nerved
51. *atjehensis.*

Utricles 2·25–2·75 mm. long, beak not more than about ·5 mm. long ; pistillate scales 1·75–2·5 mm. long :

Leaves 2–2·5 mm. broad ; spikes 3–5, uppermost 5–15 mm. long, sometimes gynaecandrous ; pistillate scales 2–2·5 mm. long ; utricles erostrate or subrostrate
110. *elibates.*

Leaves 2–6 mm. broad ; spikes 4–6, uppermost 1–4·5 mm. long, always staminate ; pistillate scales 1·75–2·25 mm. long ; beak of the utricle 0·2–0·3 mm. long :

Leaves much longer than the stems (3–6 mm. broad) ; spikes 5–6 ; pistillate scales usually mucronulate ; utricles strongly nerved . . . .
108. *neurochlamys.*

Leaves little longer than the stems (2–6 mm. broad) ; spikes 3–5 ; pistillate scales not usually mucronulate ; utricles nerveless to slenderly nerved . . . . .
109. *maculata.*

D′. Utricles sparsely to densely hairy or hispidulous, usually on one or both faces, rarely only on the margins :

Staminate spikes 2–5 :

Leaves 5–7 mm. broad ; staminate spikes 4–5 ; pistillate scales oblong-elliptic, obtuse to bilobed-emarginate at the apex ; utricles 4–4·5 mm. long, with a very oblique mouth . . . .
104. **chaetogyne.*

Leaves 2–5 mm. broad ; staminate spikes 2–3 ; pistillate scales lanceolate, acuminate ; utricles 3·5–4 mm. long, mouth not oblique . . . . . .
105. *fedia.*

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* **Carex chaetogyne** *Nelmes*, sp. nov. ; affinis *C. fediae* Nees, sed foliis latioribus, spicis femineis pluribus, utriculis longioribus ore oblique secto, praecipue differt. Type : *Kerr* 5094. Mû Pung (Mûang Pān), Siam.

Staminate spike 1 :

Pistillate scales 5–9·5 mm. long (including awns) ; utricles inflated and obscurely trigonous ; nut deeply constricted at about the middle :

Leaves 2–6 mm. broad ; spikes up to 5 cm. long ; utricles obovoid or ellipsoid-obovoid, 5–6·5 mm. long, smooth . . . . 90. *wahuensis.*

Leaves 2–3 mm. broad ; spikes up to 3 cm. long ; utricles orbicular-ovoid, about 5 mm. long, rugulose . . . . 89. *erythrolepis.*

Pistillate scales 1·5–4·5 mm. long (including awns) ; utricles distinctly trigonous and not inflated (except in *C. montivaga*) ; nut not constricted at the middle :

Stems about 60 cm. tall ; leaves numerous but situated only on the upper part of the stem ; pistillate scales 1·5–2 mm. long ; utricles densely hispidulous . . . . 106. *Maubertiana.*

Stems 1–45 cm. tall ; leaves mostly at or near the base of the stem, where they are more or less crowded, and only about 0–2 above ; pistillate scales 2–5 mm. long ; utricles not densely hispidulous (except in *C. tricuspidata*) :

Utricles 5·5–7·25 mm. long :

Stems 10–40 cm. tall ; pistillate scales 3·75–4·25 mm. long ; utricles fusiform, 6·25–7·25 mm. long . . . . 93. *Loheri.*

Stems 3·5–7 cm. tall ; pistillate scales 2·5–3·5 mm. long ; utricles rhomboid-lageniform, 5·5–6 mm. long . . . . . . 79. *rhynchachaenium.*

Utricles 2·75–5 mm. long (2·75–4 mm. long, except in *C. breviscapa*, 3·5–5 mm. long) :

Spikes 5–10 mm. long ; nut with a discoid-annulate apex :

Stems 10–20 cm. tall ; leaves 2·5–4 mm. broad ; spikes about 5 and about 5 mm. long ; pistillate scales 2–3 mm. long . . . . 82. *perciliata.*

Stems 1–10 cm. tall ; leaves 1–2·5 mm. broad ; spikes 2–4, 5–10 mm. long ; pistillate scales 3–5 mm. long . . . . . 83. *montivaga.*

Spikes 1–4·5 cm. long ; nut not discoid-annulate at the apex :

Stems 4–16 cm. tall ; leaves 3–6·25 mm. broad, very much longer than the stems ; lower bracts much longer than the inflorescence ; utricles 3·5–5 mm. long (spikes 1–3 cm. long) . . . . 78. *breviscapa.*

Stems 17–45 cm. tall ; leaves 1·25–4 mm. broad, mostly shorter to much shorter than the stems ; lower bracts much shorter than the inflorescence ; utricles 3–4 mm. long :

Leaves 2–4 mm. broad ; spikes 5–7, 1–3 cm. long ; pistillate scales 2–3 mm. long, subobtuse to subacute at the apex ; utricles 3–3·5 mm. long, sparsely hispidulous above . . . . 81. *cambodiensis.**

Leaves 1·25–2·25 mm. broad ; spikes 3–5, 1·5–4·5 cm. long ; pistillate scales 3·5–4·5 mm. long, bilobed-truncate at the apex ; utricles 4 mm. long, densely hispidulous above . . . . 107. *tricuspidata.*

C′. Lower bracts not, or lowest 1 very shortly, completely sheathing the stem, but often subamplexicaul, and sometimes auricled in front, at the base :

E. Utricles plano-convex or biconvex ; stigmas 2 (for E′ see p. 12) :

Utricles crustaceo-coriaceous, subinflated plano-convex or subinflated biconvex ; style moderately to strongly bent at the base :

Spikes cernuous, 9·5–17 cm. long, subdense- to lax-flowered ; pistillate scales 4–6 mm. long . . . 124. *sandwicensis.*

Spikes straight, 3–6 cm. long, dense-flowered ; pistillate scales 2–4 mm. long . . . . 125. *crustacea.*†

Utricles membranaceous or subcoriaceous, plano-convex or compressed biconvex, not inflated ; style straight:

Spikes, or at least the lower ones, subcernuous to pendulous ; bract of the lowest spike far exceeding the apex of the inflorescence ; scales mucronate to aristate ; utricles densely whitish- to reddish-papillose :

Staminate spikes up to 3 ; utricles strongly nerved, gradually to subgradually narrowing into the beak, minutely papillose (3·25–3·5 mm. long) 119. *inverso-nervosa.*‡

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* **Carex cambodiensis** *Nelmes*, sp. nov. ; affinis *C. tenuinervi* Ohwi, sed foliis latioribus, spicis pluribus, utriculis longioribus, praecipue differt. Type : *Poilane* 23139. Elephant Mountain, Cambodia.

† **Carex crustacea** *Nelmes*, sp. nov. ; affinis *C. sandwicensi* Boeck., sed spicis strictis brevioribus densifloris, squamis brevioribus, praecipue differt. Type : *Hillebrand* 534 (Herb. Kew.), [sphalm. 533 (Hillebr. Fl. Hawaiian Is.)].

‡ **Carex inverso-nervosa** *Nelmes*, sp. nov. ; affinis *C. tereti* Boott, sed spicis brevioribus crassioribus, utriculis majoribus ferrugineo-papillosis, praecipue differt. Type : *Milne* 175. Isle of Pines, New Caledonia.

Staminate spike 1 ; utricles nerveless to slenderly nerved, abruptly or subabruptly contracted into the beak, distinctly papillose :

- Inflorescence about 8–10 cm. long ; spikes 3–6 cm. long, about 4–6 mm. thick when the utricles are mature ; utricles 2·5–3 mm. long, elliptic to suborbicular . . . 122. *phacota.*
- Inflorescence about 5 cm. long ; spikes 1·5–3 cm. long, about 5–7 mm. thick when the utricles are mature ; utricles 3–3·5 mm. long, elliptic to ovate-lanceolate . . . 123. *pruinosa.*

Spikes all straight and erect or suberect ; bract of the lowest spike not or slightly exceeding the apex of the inflorescence ; scales not mucronate nor aristate ; utricles densely puncticulate :

- Stems 20–50 cm. tall ; leaves shorter to much shorter than the stems ; spikes about 5, lower arising from rather distant nodes ; utricles 2·5–3 mm. long, usually slightly exceeding the scales . . . . 126. *Gaudichaudiana.*
- Stems 5–10 cm. tall ; leaves mostly about as long as, but some longer than, the stems ; spikes 3–4, contiguous ; utricles 2·25–2·5 mm. long, usually exceeded by the scales . . . 127. *lacerans.*

E′. Utricles more or less trigonous ; stigmas 3 :

- Stems 15–60 cm. long ; leaves 1·5–4 mm. broad ; spikes 3–5, 1–2·5 cm. long :
  - Stems 30–60 cm. long ; leaves 2–4 mm. broad ; pistillate scales cupreous ; utricles 4 mm. long 99. *montis-eeka.*
  - Stems 15–30 cm. long ; leaves 1·5–3 mm. broad ; pistillate scales whitish ; utricles 3–3·5 mm. long . . . . 98. *subtransversa.*
- Stems 45–100 cm. or more tall ; leaves 5–15 mm. broad ; spikes 5–7, 1·5–12 cm. long (3·5–12 cm. long, except in *C. fascicularis*, 1·5–3·5 cm., and in *C. Doniana*, 1·5–4·5 cm., long) :
  - Utricles hispidulous, 3 mm. long . . 100. *nemostachys.*
  - Utricles glabrous, 3–5 mm. long :
    - Beak of the utricle with teeth about 1 mm. long ; pistillate scales, including awn, 4–7 mm. long 95. *fascicularis.*
    - Beak of the utricle with teeth much shorter than 1 mm. ; pistillate scales, including awn, 2·25–4 mm. long :
      - Spikes 8–12 cm. long ; scales pale, flushed vinaceous ; utricles 4–5 mm. long, oblong-obovoid, longitudinally rugose . . 103. *olivacea.*
      - Spikes 2·75–7·5 cm. long ; scales whitish to dirty-white ; utricles 3–4 mm. long, ellipsoid to ellipsoid-lanceolate, smooth :

Spikes 3·5–7·5 cm. long ; pistillate scales 2·25–3 mm. long, oblong-obovate to spathulate, bilobed-emarginate at the apex ; utricles reddish-spotted . 96. *baviensis*.

Spikes 1·5–4·5 cm. long ; pistillate scales 3–4 mm. long, oblong-ovate to oblong-lanceolate, acuminate ; utricles not spotted . . . . 97. *Doniana*.

A‴. Terminal and most of the other spikes androgynaeceous, i.e. pistillate below and staminate above :

F. Leaves up to 3 cm. or more broad, linear to elliptic :

Flowering stems arising from below and outside the short shoot on which are borne the foliage leaves, which are up to 6·7 cm. broad (broader than in any other known *Carex*) . . . . 1. *Adrienii*.

Flowering stems arising from the centre of a tuft of foliage leaves :

Foliage leaves all radical, broadly linear :

Leaves 1·5–3·6 cm. broad ; pistillate scales 3·5–7·5 mm. long (2–4 mm. long, excluding the awn) . . . 7. *Helferi*.

Leaves 2·7–5 cm. broad ; pistillate scales 6–8 mm. long (5–7 mm. long, excluding the awn) . . . 6. *mapaniifolia*.

Foliage leaves all cauline, elliptic or linear-elliptic :

Leaves hispidulous on all nerves on the under-surface . . . 8. *euprepes*.

Leaves smooth on the under surface except at the apex . . . 10. *cataphyllodes*.*

F′. Leaves less than 3 cm. broad, linear, rarely broadly linear :

G. Lower bracts not, or lowest 1 rarely, completely sheathing the stem, but often subamplexicaul and auricled at the base in front, inflorescence at each node often a simple spike and sometimes sessile (for G′ see p. 15) :

Spikes several to numerous at each node of the inflorescence :

Spikes several to numerous at each of the numerous nodes of a continuous or little interrupted panicle . . . . 128. *appressa*.

Spikes up to 4 at each of the few (1–4) nodes of a much interrupted panicle . . . . 21. *malaccensis*.

Spikes solitary (sometimes binate in *C. philippinensis*) at each node of the inflorescence (lowest 1–2 spikes sometimes compound in *C. divulsa* and *C. Thomsonii*) :

Spikes peduncled, 1–11 cm. long (3–11 cm. long, except in *C. Ramosii*) :

Stems 10–20 cm. tall ; leaves about 3 mm. broad ; spikes 1–3, about 1 cm. long ; utricles subinflated-trigonous, 7 mm. long, long-beaked ; stigmas 3 . . . 88. *Ramosii*.

Stems 20–110 cm. tall ; leaves 5–12 mm. broad ; spikes about 6–27, 3–20 cm. long ; utricles biconvex or compressed-biconvex, less commonly plano-convex,

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* **Carex cataphyllodes** *Nelmes*, sp. nov. ; affinis *C. euprepi* Nelmes, sed foliis angustioribus lineari-ellipticis, nervis subtus laevibus nec adpresso-hispidulis, praecipue differt. Type : *Kerr* 10371. Kao Ri Yai, Kanburi, Siam.

1·75–5 mm. long, erostrate or very shortly beaked ; stigmas 2 :

Pistillate scales 1·5–3 mm. long ; utricles 1·75–4 mm. long ; nut 1·5–1·75 mm. long :

Stems about 20 cm. tall ; leaves about 5 mm. broad ; spikes about 6, about 3 cm. long ; utricles 3–4 mm. long . . . . 116. *tahitensis.*

Stems 60–110 cm. tall ; leaves 5–12 mm. broad ; spikes 10–27, 3–11 cm. long ; utricles 1·75–3 mm. long :

Pistillate scales about as long as the utricles and 2·25–3 mm. long . . . . . . 112. *exploratorum.*

Pistillate scales much shorter than the utricles and 1·5–2 mm. long :

Spikes 10–22, sometimes binate ; utricles 2·5–2·75 mm. long, obovate-elliptic, becoming patent at maturity, margins usually vitreous-hispidulous near the erostrate apex . . . . . 111. *philippinensis.*

Spikes 15–27, single ; utricles 1·75–2·5 mm. long, elliptic, becoming patulous at maturity, margins glabrous :

Leaves about 6–9 mm. broad ; spikes about 15–20, about 4–11 cm. long and 3–4 mm. thick at maturity ; utricles about 1·75–2 mm. long, slenderly multinerved . . . 113. *Graeffeana.*

Leaves about 5–12 mm. broad ; spikes about 16–27, about 3–8·5 cm. long and 4·5–5 mm. thick at maturity ; utricles 2·25–2·5 mm. long, strongly plurinerved . . . 113a. *Graeffeana* var. *samoënsis.*

Pistillate scales 3·5–5 mm. long ; utricles 5 mm. long ; nut 2–2·5 mm. long :

Leaves about 10 mm. broad ; spikes 12, 4–20 cm. long ; pistillate scales 3 5 mm. long . . . . 114. *Stokesii.*

Leaves about 7 mm. broad ; spikes 6–7, 4–10 cm. long ; pistillate scales 4–5 mm. long . . 115. *feani.*

Spikes sessile, rarely subsessile, 3–11 mm. long (3–8 mm. long, except in *C. Thorelii,* 7–11 mm., and in *C. tricephala,* 8–10 mm., long) :

Stigmas 2 ; utricles plano-convex :

Lower bracts longer than the inflorescence :

Spikes 20 or more ; utricles 2·25–2·75 mm. long . . . 129. *Thomsonii.*

Spikes about 5–10 ; utricles 3·5–4·5 mm. long . . . 130. *nubigena.*

Lower bracts much shorter than the inflorescence :

Inflorescence about 5–17 cm. long ; lower spikes up to 5–6 cm. distant from one another . . . . . 131. *divulsa.*

Inflorescence 1·5–2·5 cm. long ; lower spikes scarcely separated from one another . . . . 132. *Pairaei.*

Stigmas 3 ; utricles more or less trigonous :

Utricles 2·25–2·5 mm. long . . . . . . 53. *satsumensis.*

Utricles 4–5 mm. long :

Utricles glabrous except the margins . . . . 36. *palawanensis.*

Utricles densely hairy :

Leaves 5–11 mm. broad ; lowest bract much longer than the inflorescence . . . 19. *Thorelii.*

Leaves 3–5 mm. broad ; lowest bract about as long as the inflorescence . . . . . 20. *tricephala.*

G′. Lower bracts sheathing, often long-sheathing, the stem ; inflorescence at each node often branched and peduncled :

H. Partial inflorescence, at each node, consisting of a single, peduncled spike :

Stigmas 2 ; utricles plano-convex to biconvex :

Leaves only about half as long as the average stems, 1·5–2·5 mm. broad ; pistillate scales 4·25–6·75 mm. long, aristate . . . . 74. *longipes.*

Leaves longer than the stems, up to 5·5 mm. broad ; pistillate scales 3·5 mm. long, mucronulate . . . . . . 70. *kinabaluensis.*

Stigmas 3 ; utricles trigonous :

Spikes 1–3, the lower or lowest often arising from basal leaf-sheaths ; pistillate scales 2·5–3 mm. long, midrib not excurrent . . . . 86. *speciosa.*

Spikes 2–7, situated in the upper part of the stem ; pistillate scales 4·5–6·5 mm. long, including the long-excurrent midrib :

Pistillate scales oblong-ovate, obtuse to very obtuse at the apex, wholly glabrous to sparsely hispidulous ; utricles 6–7 mm. long, glabrous to hispidulous on the back . . . . . . 63. *borneënsis.*

Pistillate scales ovate-lanceolate to oblong-lanceolate, subacute to obtuse at the apex, sparsely to densely hispidulous ; utricles 7–8 mm. long, subdensely to densely hispidulous . . . . 63a. *borneënsis* var. *Clemensii.*

H′. Partial inflorescence on 2 or more main penduncles at one or more of the nodes, some of the peduncles bearing 2 to numerous spikes (for H′′ see p. 18) :

I. Utricles glabrous except the margins (for I′ see p. 17) :

Stigmas 2 ; utricles plano-convex :

Stems about 35–60 cm. tall ; leaves 2–3·5 mm. broad ; spikes 2–4-fascicled ; utricles broadly elliptic-lanceolate, with strong nerves and a broad, stout beak . . . . 68. *Meyenii.*

Stems about 70–80 cm. tall ; leaves 1·5–2 mm. broad ; spikes 3–5-fascicled ; utricles narrowly elliptic, with slender nerves and a very slender beak . . . 72. *spathaceo-bracteata.*

Stigmas 3 ; utricles obscurely to distinctly trigonous :

Spikes 2-8 cm., mostly 2·5–6 cm., long :

Leaves about 6 mm. broad ; spikes mostly about 2·5–3·5 cm. long, staminate part usually longer than the pistillate part . . . . 58. *Gibbsiae.*

Leaves about 4 mm. broad ; spikes mostly about 4–6 cm. long, staminate part usually less than one-third the whole length . . . . . . 59. *turrita.*

Spikes 4–17 mm., usually less than 10 mm., long :

Inflorescence 10 cm. long ; leaves up to 3 mm. broad ; utricles nerveless except for 1–2 marginal nerves . . . . 46. *xestogyne.**

Inflorescence more, usually much more, than 10 cm. long ; leaves 3–13 mm. broad ; utricles slenderly to strongly nerved :

Bracts all much exceeding the apex of the inflorescence ; utricles subinflated, obscurely trigonous, strongly spongy-ribbed (leaves 6–13 mm. broad) . . . . 24. *cruciata.*

Bracts usually shorter than, but sometimes exceeding, the inflorescence, utricles not inflated, distinctly trigonous, not spongy-ribbed, all except those of *C. breviceps* nerveless or slenderly nerved :

Pistillate scales 3–4 mm. long ; utricles 4–4·5 mm. long :

Leaves 5–12 mm. broad ; secondary panicles about 6–10 ; bracts mostly shorter than the inflorescence ; utricles ellipsoid to obovoid, slenderly multinerved . . . . . . 43. *saturata.*

Leaves 4 mm. broad ; secondary panicles 10 to more numerous ; bracts exceeding the inflorescence ; utricles narrowly ellipsoid, scarcely nerved . . . . . 39. *neo-hebridensis.*

Pistillate scales 1·75–2·5 mm. long ; utricles 2·75–3·5 mm. long :

Leaves 3–4 mm. broad ; utricles strongly nerved . . . . 3. *breviceps.*

Leaves 4–13 mm. broad ; utricles from almost nerveless to slenderly nerved :

Leaves 4–8 mm. broad ; pistillate scales 1·75–2 mm. broad . . . . . 41. *filicina.*

Leaves 7–13 mm. broad ; pistillate scales 2–2·5 mm. broad :

Leaves 7–10 mm. broad ; lower bracts shorter than the inflorescence . . . 29. *semiglomerata.*

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* **Carex xestogyne** *Nelmes*, sp. nov. ; affinis *C. plebeiae* C. B. Clarke, sed spicis brevioribus, utriculis brevioribus enerviis marginibus exceptis glabris, praecipue differt. Type : *Boden Kloss s.n.* Camp XIII–XI, Mt. Carstensz, Dutch New Guinea.

Leaves 10–13 mm. broad ; lower bracts equalling or exceeding the inflorescence . . . . . . 38. *Rafflesiana.*

I′. Utricles sparsely to densely hairy or hispidulous on a part of their surface besides the margins :

Stigmas 2 ; utricles plano-convex to biconvex :

Stigmas about as long as the utricles . . . . 69. *brunnea.*

Stigmas at least twice as long as the utricles :

Leaves 1·5–2 mm. broad ; utricles 5 mm. long . . . 73. *teinogyna.*

Leaves 2–4 mm. broad ; utricles 3·5–4 mm. long . . . 71. *scabriculmis.*

Stigmas 3 ; utricles obscurely to distinctly trigonous :

Flowering stems arising from below and outside the foliage leaves . . . . 2. *rhizomatosa.*

Flowering stems arising from the centre of the tuft of foliage leaves :

Spikes 1–6 cm. long :

Leaves 2–5 mm. broad ; partial panicles on 1–5 peduncles ; pistillate scales 2·25–2·75 mm. long ; utricles 3–3·75 mm. long . . . . 60. *Merrillii.*

Leaves 5–14 mm. broad ; partial panicles on 1–3 peduncles ; pistillate scales 3–6 mm. long ; utricles 4·75–9 mm. long :

Leaves 12–14 mm. broad ; utricles 8–9 mm. long 66. *Vansteenisii.*

Leaves 5–12 mm. broad ; utricles 4·75–7 mm. long :

Leaves 9–12 mm. broad :

Leaves all much shorter than the stem , pistillate scales 3·5–4 mm. long . . . 16. *tonkinensis.*

Leaves from shorter to longer than the stem ; pistillate scales 5–6 mm. long . 56. *arridens.*

Leaves 5–8 mm. broad :

Spikes 1–1·5 cm. long ; pistillate scales whitish (3·5–6 mm. long) ; utricles 4·75–6 mm. long, 1·3–1·8 mm. broad 15. *perakensis.*

Spikes 1–4 cm. long ; pistillate scales castaneous except on the margins ; utricles 5–7 mm. long, 1–1·3 mm. broad :

Pistillate scales 5–6 mm. long (3·5–4 mm. long, excluding the awn) (spikes 1·5–4 cm. long ; utricles 6–7 mm. long) 64. *pseudo-rivulorum.*

Pistillate scales 3–4 mm. long (2·25–2·5 mm. long, excluding the awn) (spikes 1–3 cm. long ; utricles 5–6·5 mm. long) . . . . 65. *breviglumis.*

Spikes 4–12 mm. long (4–8 mm. long, except in *C. gembolensis*) :

Pistillate scales pale brownish-white ; utricles with 2 spongy-thickened nerves on the dorsal face 25. *spongoneura.*[*]

Pistillate scales castaneous, reddish-brown, or fuscous ; utricles not spongy-nerved :

Leaves 2–6 mm. broad ; inflorescence about 10–30 cm. long :

Leaves 2–3 mm. broad ; spikes 5–8 mm. long ; pistillate scales acute at the apex ; utricles 3 mm. long . . . . 33. *sarawaketensis.*

Leaves 3–6 mm. broad ; spikes 7–12 mm. long ; pistillate scales obtuse to very obtuse at the apex ; utricles 3·5–4·5 mm. long . . . . 40. *gembolensis.*

Leaves 7–14 mm. or more broad ; inflorescence about 50–100 cm. long :

Utricles 2·75–3 mm. long . . . 38. *Rafflesiana.*

Utricles 3·25–4 mm. long :

Pistillate scales glabrous to sparsely hispidulous ; panicles lax . . . . 38a. *Rafflesiana* var. *scaberrima.*

Pistillate scales sparsely to densely hispidulous ; panicles dense . . . . 38b. *Rafflesiana* var. *macrothyrsa*

H''. Partial inflorescences on only 1 main peduncle at each node, but one or more branching into few or many spikes :

J. Utricles from wholly glabrous to hispidulous on the margins (for J' see p. 20) :

Spikes 2–6 cm. long ; utricles ovoid to globose . . . . . 48. *baccans.*

Spikes 4–22 mm. long ; utricles ellipsoid or oblong-ellipsoid to obovoid :

Spikes 10–22 mm. long ; staminate part of the spike much longer than the pistillate part ; utricles inflated and obscurely trigonous . . . . 22. *indica.*

Spikes 4–15 mm. long, staminate part of the spike from very much shorter to somewhat longer than the pistillate part ; utricles not inflated but distinctly trigonous (except in *C. Dietrichiae*) :

Leaves 15–25 mm. broad ; utricles transversely rugose . . . . 12. *blepharolepis.*[†]

Leaves 4–15 mm. broad ; utricles not rugose :

Pistillate scales about 1·25 mm. long ; utricles 2·5 mm. long . . . . 42. *sclerioides.*

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[*] **Carex spongoneura** *Nelmes*, sp. nov. ; affinis *C. cruciatae* Wahlenb., sed inflorescentiis brevioribus oblongis, utriculis magis distincte trigonis, praecipue differt. Type : *Gibbs* 4093. Mt. Kinabalu, British North Borneo.

[†] **Carex blepharolepis** *Nelmes*, sp. nov. ; affinis *C. spatiosae* Boott, sed squamis femineis brevioribus glabris, utriculis brevioribus, praecipue differt. Type : *Van Steenis* 5457. Priangan, Java.

Pistillate scales 1·5–4·5 mm. long ; utricles 3–4·5 mm. long :

K. Pistillate scales reddish or castaneous or flecked or splashed with one or other of these colours :

Utricles inflated, obscurely trigonous (spikes 5–15 mm. long ; staminate and pistillate parts of the spike usually about equal in length) . . . . 23. *Dietrichiae*.

Utricles not inflated, distinctly trigonous :

Leaves shorter than the stems, 4–6 mm. broad ; pistillate scales about 2 mm. long . . . . 32. *neo-guineënsis*.

Leaves longer than the stems, 5–12 mm. broad ; pistillate scales 2–4 mm. long :

Spikes 7–15 mm. long ; pistillate scales wholly dark reddish, 3–4 mm. long (leaves 5–12 mm. broad) . 43. *saturata*.

Spikes 4–10 mm. long ; pistillate scales reddish-flecked or splashed, 2–3 mm. long :

Lower bracts much shorter than the inflorescence : spikes about 5 mm. long ; pistillate scales reddish-flecked ; utricles oblong-ellipsoid, slenderly nerved (leaves 6–10 mm. broad) . . . . 37. *Clarkeana*.

Lower bracts much longer than the inflorescence ; spikes 4–10 mm. long ; pistillate scales reddish-splashed ; utricles obovoid or ellipsoid-obovoid, strongly nerved (leaves 7–11 mm. broad) . . . . . . 27. *lamprochlamys*.

K′. Pistillate scales from milky or dirty white to light brown :

Leaves 8–15 mm. broad :

Leaves 12–15 mm. broad ; inflorescence about 35–40 cm. long . . 28. *Horsfieldii*.

Leaves 8–13 mm. broad ; inflorescence about 3–14 cm. long . . . . 9. *laosensis*.

Leaves 5–8 mm. broad :

Secondary panicles 4–5 ; pistillate scales about 2 mm. long ; utricles wholly glabrous . . . . 13. *plagiostoma*.*

Secondary panicles 5–8 ; pistillate scales 2–3·25 mm. long ; utricles hispidulous or serrulate on the margins of the beak :

Secondary panicles 1·5–3·5 cm. long ; spikes 4–5 mm. long . . 34. *cirrhulosa*.

***Carex plagiostoma** *Nelmes*, sp. nov. ; affinis *C. stramentitiae* Boott ex Boeck., sed spicis brevioribus, squamis femineis minoribus apice bilobo-emarginatis, utriculis apice reflexis, praecipue differt. Type : *Balansa* 2819. Mt. Bavi, Siam.

Secondary panicles 2·5–10 cm. long ; spikes 5–15 mm. long :

Secondary panicles 3·5–7·5 cm. long ; spikes 6–15 mm. long ; pistillate scales brown with a broad whitish margin, distinctly nerved, midrib excurrent in an awn up to 1·5 mm. long . . . . 26. *fissilis.*

Secondary panicles 2·5–10 cm. long ; spikes 5–10 mm. long ; pistillate scales milky white, nerveless to very slenderly nerved, midrib excurrent in an awn up to 0·5 mm. long . . . . 30. *galactolepis.**

J'. Utricles more or less hairy or hispidulous on at least a part of their surface besides the margins :

Flowering stems arising from the axils of basal foliage leaves . . . . 75. *cryptostachys.*

Flowering stems arising from the centre of a tuft of foliage leaves :

Spikes (excluding small lateral ones) 2–7 cm. long ; margins of lower leaf-sheaths splitting into herring-bone-shaped fibres :

Spikes about 15–22 from 8–10 nodes ; pistillate scales sparsely to subdensely hispidulous ; utricles about 3 mm. long, ellipsoid to obovoid, subdensely hispidulous above, beak about 0·5 mm. long . . . . 49. *composita.*

Spikes about 5–15 from 5–7 nodes ; pistillate scales glabrous ; utricles 4 mm. long to slightly shorter, ellipsoid to ovoid, sparsely hispidulous above, beak about 1 mm. long . . . . 50. *longibracteata.*

Spikes 3–20 mm. long (3–15 mm. long except in *C. phyllocaula*) ; lower sheaths not splitting into herring-bone-shaped fibres, but eventually withering into straight fibres :

L. Leaves 7–25 mm. broad (10–25 mm. broad except in *C. nodiflora*) (for L' see p. 21) :

Inflorescence 4–8 cm. long ; spikes 8–15 mm. long :

Leaves 12–22 mm. broad ; pistillate scales 3–3·5 mm. long ; utricles 4–5 mm. long . . . 18. *sychnostachya.*

Leaves 10–12 mm. broad ; pistillate scales 5–6 mm. long ; utricles 6·5–8 mm. long . . . 14. *leucostachys.*

Inflorescence 15–35 cm. long ; spikes 5–10 mm. long :

Leaves 17–25 mm. broad ; pistillate scales 2·5–4 mm. long ; utricles 4–6 mm. long, sparsely hispidulous, beak 1·5–3 mm. long :

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* **Carex galactolepis** *Nelmes*, sp. nov. ; affinis *C. vesiculosae* Boott, sed foliis latioribus, utriculis longioribus glabris valde nervosis, praecipue differt. Type : *King's Collector* 1906, Larut, Perak.

Leaves 20–25 mm. broad ; inflorescence about 25 cm. long ; utricles 4–5 mm. long, beak 1·5–2 mm. long ; rhachis and some other parts of the plant strikingly rufo-hispidulous . . . . 4. *Balansae.*

Leaves 17–20 mm. broad ; inflorescence about 15 cm. long ; utricles 5–6 mm. long, beak 2–3 mm. long ; rhachis and some other parts of the plant whitish-hispidulous 11. *spatiosa.*

Leaves 7–15 mm. broad ; pistillate scales 2·25–2·5 mm. long ; utricles 4 mm. long, densely hispidulous, beak about 1 mm. long :

Pistillate scales conspicuously hispid on the midrib ; utricles 2·75–3 mm. long, sub-inflated and obscurely trigonous, glabrous except on the margins and on several nerves near the apex ; nut 1·75–2 mm. long . . . . 35. *fuirenoides.*

Pistillate scales not conspicuously hispid on the midrib ; utricles 4 mm. long, distinctly trigonous, sparsely to densely whitish-hispidulous except at the base ; nut 2·25–2·5 mm. long :

Stems 50–70 cm. tall ; inflorescence a compound panicle ; pistillate scales aristate ; utricles rhomboid-ellipsoid 31. *nodiflora.*

Stems 40–50 cm. tall ; inflorescence a little-branched panicle ; pistillate scales mucronulate ; utricles ellipsoid to obovoid-ellipsoid . . . . 17. *Jeanpertii.*

L′. Leaves 2–6·5 mm. broad :

Spikes 1·5–2 cm. long ; pistillate scales 4·75–8 mm. long ; utricles 5–6 mm. long . . . 67. *phyllocaula.**

Spikes 4–11 mm. long ; pistillate scales 2–3 mm. long ; utricles 3–5·5 mm. long :

Inflorescence 6–8 cm. long ; secondary panicles each consisting of 2–4 simple spikes ; utricles 4·5–5·5 mm. long . . 52. *pycnothyrsos.*

Inflorescence 8–33 cm. long ; secondary panicles each consisting of more numerous branched and simple spikes ; utricles 3–4·25 mm. long :

Peduncles of the secondary panicles hispidulous above ; sheaths densely hispidulous at the mouth ; utricles cuneate-obovoid, densely hispidulous except at the base . . . . 47. *timorensis.*

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* **Carex phyllocaula** *Nelmes*, sp. nov. ; affinis *C. Vansteenisii* Kükenth,, sed foliis angustioribus, inflorescentiis et spicis brevioribus, utriculis brevioribus, praecipue differt. Type : *Kerr* 6615. Doi Chiengdão, Siam.

Penduncles of the secondary panicles, and sheaths, glabrous ; utricles ellipsoid, sparsely hispidulous above, glabrous below:
 Leaves shorter than the stems ; pistillate scales 2–3 mm. long ; utricles ellipsoid, 3·75–4·25 mm. long ; nut 2·5 mm. long . . . . 45. ***plebeia.***
 Leaves much longer than the stems ; pistillate scales 1·25–2·5 mm. long ; utricles usually oblong-obovoid, 3–3·5 mm. long ; nut 2 mm. long . 44. ***continua.***

Some time after this key was completed I heard from Mr. S. T. Blake, of Brisbane, that he had been requested to deal with the *Cyperaceae* collected by L. J. Brass in New Guinea. Among the *Carices* were several new species. Two of these, which Mr. Blake proposed to call *C. lamprochlamys* and *C. montivaga*, seemed identical with two which I had included in my key (with Latin diagnoses), so I suppressed my names in favour of his. He kindly sent me notes of his other species, and scraps of material of some of them, with their proposed names, but I was unable to add these to the key in the absence of fuller descriptions. It is not certain whether Mr. Blake's descriptions will appear before or after this key is published, so I omit mention of his names here.

ENUMERATION

In the references to literature " C. B. Clarke," standing alone, refers to his List of the Carices of Malaya in Journ. Linn. Soc. **37**, 1904, and " Kükenth." to the latter's monograph in Engl. Pflanzenreich, IV, **20**, 1909.

1. *Carex Adrienii* E. G. Camus in Lecomte, Fl. Gén. Indo-Chine, **7,** 186 (1912) ; Nelmes in Hook. Ic. Pl. t. 3434 (1943).—*C. scaposa* var. *baviensis* Franch. in Nouv. Arch. Mus. Hist. Nat. sér. 3, **8,** 255 (1896) ; C. B. Clarke in Journ. Linn. Soc. **37,** 8 (1904) ; Kükenth. in Engl. Pflanzenreich, IV, **20,** 286 (1909).—Indo-China.

2. *C. rhizomatosa* Steud. in Zoll. Verz. Ind. Archip. 60 (1854) ; C. B. Clarke, 12 ; Kükenth. 289.—*C. oligostachya* Nees ex Hook. in Kew Journ. Bot. **6,** 2 (1854).—*C. Cumingiana* Steud. Synops. Cyper. 206 (1855).—? *C. bukaënsis* Palla in Rechinger, Bot. u. Zool. Ergebn. von den Samoa u. Salomonsinseln. 3 [500] (1913).—Indo-China, Sumatra, Philippines, Sumbawa, N. Guinea, Solomons. (Assam, U. Burma.)

3. *C. breviceps* Kükenth. in Engl. Bot. Jahrb. **69,** 263 (1938).—N. Guinea.

4. *C. Balansae* Franch. in Nouv. Arch. Mus. Hist. Nat. sér. 3, **8,** 258 (1896) ; C. B. Clarke, 11 ; Kükenth. 265.—Indo-China.

5. *C. hypolytroides* Ridl. in Journ. F.M.S. Mus. **8,** 124 (1917).—*C. hypolytroides* Gross et Mattfeld (pro sp. nov.) in Notizbl. Bot. Gart. Berl. **14,** 190 (1938).—Indo-China, Sumatra.

6. *C. mapaniifolia* Ridl. in Journ. F.M.S. Mus. **10,** 124 (1920).—Siam.

7. *C. Helferi* Boeck. in Linnaea, **40,** 365 (1876) ; Kükenth. 286.—L. Burma, Siam.

8. *C. euprepes* Nelmes in Kew Bull. 1939, 305, et in Hook. Ic. Pl. t. 3433 (1943).—Indo-China.

9. *C. laosensis* Nelmes in Kew Bull. 1939, 305.—Indo-China.

10. *C. cataphyllodes* Nelmes (supra, p. 13).—Siam.

11. *C. spatiosa* Boott, Illustr. **2,** 86, t. 246 (1860) ; C. B. Clarke, 12 ; Kükenth. 265.—Indo-China.

12. *C. blepharolepis* Nelmes (supra, p. 18).—*C. spatiosa* var. *bogorensis* C. B. Clarke, 12.—*C. Horsfieldii* Boott, Kükenth, 273, partim.—Java.

13. *C. plagiostoma* Nelmes (supra, p. 19).—*C. stramentitia* Boott ex Boeck., C. B. Clarke, 9, partim ; Kükenth. 265 (" ex Clarke ") partim. —Indo-China.

14. *C. leucostachys* Ridl. in Kew Bull. 1928, 77.—Malay Peninsula.

15. *C. perakensis* C. B. Clarke in Hook. f. Fl. Brit. Ind. **6,** 720 (1894) ; C. B. Clarke, 9.—*C. Wightiana* var. *perakensis* (C. B. Clarke) Kükenth. 288.—Malay Peninsula.

16. *C. tonkinensis* Franch. in Nouv. Arch. Mus. Hist. Nat. sér. 3, **8,** 251 (1896) ; C. B. Clarke, 14 ; Kükenth. 292.—Indo-China, Sumatra.

17. *C. Jeanpertii* E. G. Camus in Lecomte, Not. Syst. **1,** 295 (1910).—Indo-China.

18. *C. sychnostachya* Nelmes in Kew Bull. 1939, 658.—Siam.

19. *C. Thorelii* E. G. Camus in Lecomte, Not. Syst. **1,** 295 (1910, 21 Dec.).—*C. plesiocephala* Turrill in Kew Bull. 1910 (24 Dec.), 385.—Indo-China, Siam. (U. Burma.)

20. *C. tricephala* Boeck. in Flora, **58,** 263 (1875) ; Kükenth. 289.—*C. madoerensis* C. B. Clarke, 15.—Madura.

21. *C. malaccensis* C. B. Clarke in Hook. f. Fl. Brit. Ind. **6,** 722 (1894) ; C. B. Clarke, 9 ; Kükenth. 289.—Malay Peninsula.

22. *C. indica* L. Mant. II, 574 (1771) ; C. B. Clarke, 8 ; Kükenth. 262.—Indo-China, Siam, Malay Peninsula, Java. (Sikkim, Assam, Nicobar Is.)

23. *C. Dietrichiae* Boeck. in Flora, **58,** 122 (1875) ; C. B. Clarke, 8.—*C. indica* var. *fissilis* (Boott) Kükenth., Kükenth. 264, partim.—? Indo-China, Malay Peninsula, Borneo, Philippines, N. Guinea, Solomons, N. Caledonia, Fiji. (Queensland.)

24. *C. cruciata* Wahlenb. in Vet. Akad. Handl. Stockholm, **24,** 149 (1803) ; C. B. Clarke, 9 ; Kükenth. 265.—Indo-China, L. Burma, Malay Peninsula, Borneo, Sumatra. (Himalayas, Assam, China, Japan.)

25. *C. spongoneura* Nelmes (supra, p. 18).—*C. cruciata* Wahlenb., sec. Stapf et Turrill in Journ. Linn. Soc. **42,** 182 (1914), *non* Wahlenb.—Sumatra, Borneo, Philippines.

26. *C. fissilis* Boott, Illustr. **2,** 86, t. 245 (1860).—*C. indica* L. var. *fissilis* (Boott) Kükenth. 264, partim.—N. Caledonia.

27. *C. lamprochlamys* S. T. Blake.—N. Guinea.

28. *C. Horsfieldii* Boott in Proc. Linn. Soc. **1,** 257 (1845) ; C. B. Clarke, 11 ; Kükenth. 273.—*C. spatiosa* var. *bogorensis* C. B. Clarke, Kükenth. 273.—Java.

29. *C. semiglomerata* Kükenth. in Bull. Jard. Bot. Buitenz. sér. 3, **16,** 315 (1940).—Sumatra.

30. *C. galactolepis* Nelmes (supra, p. 20).—*C. repanda* var. *implumis* C. B. Clarke, 9.—? *C. Wightiana* var. *repanda* (C. B. Clarke) Kükenth. 288, partim.—Malay Peninsula, Borneo.

31. *C. nodiflora* Boeck. in Engl. Bot. Jahrb. **5,** 516 (1884) ; Kükenth.

288.—*C. Cumingii* Vidal, Phanerog. Cuming. 156 (1885) ; C. B. Clarke, 11.—Philippines, Sumatra.

32. *C. neo-guineënsis* C. B. Clarke in Journ. Linn. Soc. **37,** 12 (1904) ; Kükenth. 280.—N. Guinea.

33. *C sarawaketensis* Kükenth. in Engl. Bot. Jahrb. **69,** 262 (1938).—N. Guinea.

34. *C. cirrhulosa* Nees in Hook. Kew Journ. Bot. **6,** 29 (1854).—*C. fibrata* Boott apud Vidal, Phanerog. Cuming. 156 (1885).—*C. fuirenoides* Gaudich., C. B. Clarke, 11, partim.—*C. fuirenoides* var. *cirrhulosa* (Nees) Kükenth. 287.— Philippines.

35. *C. fuirenoides* Gaudich, in Freycinet Voy. Bot. 412 (1826) ; C. B. Clarke, 11, partim ; Kükenth. 287.—Marianas : Guam.

36. *C. palawanensis* Kükenth. in Leafl. Philipp. Bot. **4,** 1169 (1911).—Philippines.

37. *C. Clarkeana* Kükenth. in Bull. Herb. Boiss. sér. 2, **4,** 52 (1904) ; Kükenth. 282.—Malay Peninsula.

38. *C. Rafflesiana* Boott in Trans. Linn. Soc. **20,** 132 (1846) ; C. B. Clarke, 10 ; Kükenth. 282.—Sumatra, Java. (? Queensland.)

38a. *C. Rafflesiana* var. *scaberrima* (Boeck.) Kükenth. in Eng. Pflanzenr. IV, **20,** 283 (1909).—*C. scaberrima* C. B. Clarke, 10.—Philippines.

38b. *C. Rafflesiana* var. *macrothyrsa* (Miq.) Kükenth. in Engl. Pflanzenr. IV, **20,** 282 (1909).—*C. macrothyrsa* Miq. Fl. Ind. Bat. **3,** 351 (1855).—Java.

39. *C. neo-hebridensis* Guillaum. et Kükenth. in Bull. Mus. Hist. Nat. Paris, sér. 2, **9,** 304 (1937).—N. Hebrides.

40. *C. gembolensis* C. B. Clarke in Journ. Linn. Soc. **37,** 10 (1904).—? *C. vesiculosa* Boott, Kükenth. 283, partim.—Java, Lombok.

41. *C. filicina* Nees in Wight, Contrib. Bot. Ind. 123 (1834) ; C. B. Clarke, 11 ; Kükenth. 274.—Sumatra, Philippines, Java. (India, Ceylon, China, Japan.)

42. *C. sclerioides* Ridl. in Trans. Linn. Soc. Bot. **9**, 247 (1916).—N. Guinea.

43. *C. saturata* C. B. Clarke in Journ. Linn. Soc. **37,** 12 (1904).—*C. filicina* var. *saturata* (C. B. Clarke) Kükenth. 275.—Borneo.

44. *C. continua* C. B. Clarke in Hook. f. Fl. Brit. Ind. **6,** 717 (1894) ; C. B. Clarke, 11 ; Kükenth. 281.—Philippines, N. Guinea. (Nepal, Sikkim, U. Burma, China.)

45. *C. plebeia* C. B. Clarke in Hook. f. Fl. Brit. Ind. **6,** 718 (1894).—*C. continua* var. *plebeia* (C. B. Clarke) Kükenth. 282.—Siam. (India.)

46. *C. xestogyne* Nelmes (supra, p. 16).—N. Guinea.

47. *C. timorensis* (C. B. Clarke) Nelmes, comb. nov.—*C. gembolensis* var. *timorensis* C. B. Clarke, 10.—?*C. vesiculosa* Boott, Kükenth. 283, partim.—Timor.

48. *C. baccans* Nees in Wight, Contrib. Bot. Ind. 122 (1834) ; C. B. Clarke,. 14 ; Kükenth, 258.—*C. curvirostris* Kunze, Suppl. Riedgr. 79, t. 20 (1840–50) ; C. B. Clarke, 14.—Indo-China, Siam, Malay Peninsula, Sumatra, Philippines, Java, N. Guinea. (India, Ceylon, U. Burma, Formosa, S. China, Japan.)

49. *C. composita* Boott, Illustr. **1,** 3, t. 8 (1858) ; Kükenth, 259.—L. Burma. (Bhutan, Assam.)

50. *C. longibracteata* Steud. in Zoll. Verz. Ind. Archip. 60 (1854) ; C. B. Clarke, 15 ; Kükenth. 260.—Sumatra, Java.

51. *C. atjehensis* Kükenth. in Bull. Jard. Bot. Buitenz. sér. 3, **16,** 314 (1940).—Sumatra.

52. *C. pycnothyrsos* Kükenth. in Philipp. Journ. Sci. **6,** 60 (1911).—Philippines.

53. *C. satsumensis* Franch. et Savat. Enum. Pl. Japon. **2,** 132, 558 (no. 2085) (1879) ; Ohwi in Mem. Coll. Sci. Kyoto Imp. Univ. Ser. B, **11,** 458 (1936).—*C. nikoënsis* Franch. et Savat. l.c. 132, 558 (no. 2086) (1879) ; Kükenth. 252.—Philippines. (Japan.)

54. *C. Petelotii* Gross in Notizbl. Bot. Gart. Berl. **14,** 191 (1938).—Indo-China.

55. *C. capillacea* Boott, Illustr. **1,** 44, t. 110 (1858) ; C. B. Clarke, 7.—*C. rara* subsp. *capillacea* (Boott) Kükenth. 102.—Sumatra, Borneo, Philippines, Java, N. Guinea. (India, Japan, China, N.S. Wales.)

56. *C. arridens* C. B. Clarke in Hook. f. Fl. Brit. Ind. **6,** 726 (1894) ; C. B. Clarke, 13 ; Kükenth. 548.—L. Burma, Malay Peninsula.

57. *C. javanica* Boeck. Cyp. Nov. **1,** 43 (1888).—*C. Walkeri* Arn. ex Boott, Kükenth. 546, partim.—Indo-China, Malay Peninsula, Java.

58. *C. Gibbsiae* Rendle in Journ. Linn. Soc. **39,** 180 (1909).—Fiji.

59. *C. turrita* C. B. Clarke in Journ. Linn. Soc. **37,** 13 (1904).—*C. Walkeri* var. *turrita* (C. B. Clarke) Kükenth. 546.—Sumatra, Philippines.

60. *C. Merrillii* Kükenth. in Fedde, Repert. Spec. Nov. **8,** 7 (1910).—Philippines.

61, *C. celebica* Kükenth. in Bull. Jard. Bot. Buitenz. sér. 3, **16,** 318 (1940).—Celebes.

62. *C. hypsophila* Miq. Fl. Ind. Bat. **3,** 354 (1857) ; C. B. Clarke, 13 ; Kükenth. 546.—*C. tartarea* Ridl. in Journ. Bot. **23,** 35 (1885).—*C. sumatrensis* C. B. Clarke, 13.—Sumatra, Java.

62a. *C. hypsophila* var. *Havilandii* (C. B. Clarke) Kükenth. in Engl. Pflanzenr. IV, **20,** 546 (1909).—*C. Havilandii* C. B. Clarke, 13.—Borneo.

63. *C. borneënsis* C. B. Clarke in Journ. Linn. Soc. **37,** 14 (1904) ; Kükenth. in Bull. Jard. Bot. Buitenz. sér. 3, **16,** 320 (1940).—*C. fusiformis* var. *borneënsis* (C. B. Clarke) Kükenth. 598.—Borneo.

63a. *C. borneënsis* var. *Clemensii* (Kükenth.) Kükenth. in Bull. Jard. Bot. Buitenz. sér. 3, **16,** 320 (1940).—*C. Clemensii* Kükenth. in Fedde, Repert. Spec. Nov. **29,** 202 (1931).—Borneo.

64. *C. pseudo-rivulorum* Kükenth. in Bull. Jard. Bot. Buitenz. sér. 3, **16,** 319 (1940).—*C. rivulorum* Ridl. in Journ. F.M.S. Mus. **6,** 195 (1915), *non* Dunn.—Malay Peninsula, Sumatra, Borneo.

65. *C. breviglumis* Ridl. in Fl. Mal. Penins. **5,** 183 (1925).—Malay Peninsula.

66. *C. Vansteenisii* Kükenth. in Bull. Jard. Bot. Buitenz. sér. 3, **16,** 320 (1940).—? Indo-China, Sumatra.

67. *C. phyllocaula* Nelmes (supra, p. 21).—Siam.

68. *C. Meyenii* Nees in Nov. Act. Nat. Cur. **19,** Suppl. i, 123 (1843).—*C. brunnea* var. *Meyenii* (Nees) Kükenth. 601.—Hawaii.

69. *C. brunnea* Thunb. Fl. Japon. 38 (1784) ; C. B. Clarke, 5 ; Kükenth, 599.—Indo-China, Celebes, Philippines, N. Guinea, N. Caledonia. (S. India, Ceylon, Assam, U. Burma, China, Japan, Queensland, Lord Howe Island.)

70. *C. kinabaluensis* Stapf in Journ. Linn. Soc. **42,** 183 (1914).—Borneo.

71. *C. scabriculmis* (Kükenth.) Ohwi in Acta Phytotax. et Geobot. **2,** 27 (1933).—*C. teinogyna* var. *scabriculmis* Kükenth. 602.—Indo-China. (S. Japan, Korea.)

72. *C. spathaceo-bracteata* Kükenth. in Engl. Bot. Jahrb. **70,** 466 (1940).—N. Guinea.

73. *C. teinogyna* Boott, Illustr. **1,** 60, t. 158 (1858) ; Kükenth. 602.—Sumatra, Java. (Assam, U. Burma.)

74. *C. longipes* D. Don in Trans. Linn. Soc. **14,** 329 (1825) ; Kükenth. 603.—Java. (S. India, Himalayas, Assam, China.)

75. *C. cryptostachys* Brongn. in Duperry, Voy. ' Coquille,' Bot. 152, t. 25 (1828) ; C. B. Clarke, 8 ; Kükenth. 471.—Indo-China, Siam, Malay Peninsula, Sumatra, Philippines, Java, Moluccas, N. Guinea. (Hongkong, Formosa, Queensland.)

76. *C. pleurocaula* Nelmes (supra, p. 7).—Indo-China.

77. *C. lageniformis* Nelmes in Kew Bull. 1939, 658.—Siam.

78. *C. breviscapa* C. B. Clarke in Hook. f. Fl. Brit. Ind. **6,** 736 (1894) ; Kükenth. 474.—*C. Curtisii* Ridl. Mat. Fl. Mal. Penins. pt. 3, 117 (1907).—*C. lutchuensis* Ohwi in Mem. Coll. Sci. Kyoto Imp. Univ. Ser. B, **11,** 343 (1936).—Indo-China, Malay Peninsula, Borneo, Philippines, Java. (Ceylon, Formosa, Queensland.)

79. *C. rhynchachaenium* C. B. Clarke ex Merrill in Bull. Dep. Bur. Gov. Labor. Manila, no. 35, 5 (1905) ; Kükenth. 480.—Borneo, Philippines.

80. *C. multifolia* Ohwi in Mem. Coll. Sci. Kyoto Imp. Univ. Ser. B, **5,** 264 (1930).—Philippines. (Japan.)

81. *C. cambodiensis* Nelmes (supra, p. 11).—Indo-China.

82. *C. perciliata* (Kükenth.) Nelmes, comb. nov.—*C. breviculmis* var. *perciliata* Kükenth. 469.—*C. breviculmis* R. Br., C. B. Clarke, 16.—N. Guinea.

83. *C. montivaga* S. T. Blake.—*C. bulbostylis* Kükenth. in Engl. Bot. Jahrb. **69,** 264 (1938), *non* Mackenzie.—Borneo, Philippines.

84. *C. pocilliformis* Boott, Illustr. **4,** 175, t. 593 (1867).—*C. tristachya* var. *pocilliformis* (Boott) Kükenth. 473.—Philippines. (Korea, Formosa, S. Japan.)

85. *C. tristachya* Thunb. Fl. Japon. 38 (1784) ; Kükenth. 471.—Borneo. (China, Japan.)

86. *C. speciosa* Kunth, Enum. Pl. **2,** 504 (1837) ; C. B. Clarke, 14 ; Kükenth. 481.—Indo-China, Siam, Borneo, Java. (India.)

87. *C. Harlandii* Boott, Illustr. **2,** 87, t. 255 (1860) ; Kükenth. 630.—Indo-China, Sumatra, Java. (China.)

88. *C. Ramosii* Kükenth. in Fedde, Repert. Spec. Nov. **8,** 8 (1910).—Philippines.

89. *C. erythrolepis* Kükenth. in Engl. Pflanzenr. IV, **20,** 628 (1909).—Java.

90. *C. wahuensis* C. A. Mey. in Mém. Acad. St. Pétersb. **1,** 218, t.x (1831) ; Kükenth. (as *C. oahuensis*) 631.—? *C. nuptialis* Boott, Illustr. **4,** p. 175, t. 591 (1867).—Hawaii.

91. *C. Jackiana* Boott in Proc. Linn. Soc. **1,** 260 (1848) ; C. B. Clarke, 15 ; Kükenth. 638.—Sumatra, Java. (India.)

92. *C. Elmeri* Kükenth. in Fedde, Repert. Spec. Nov. **8,** 326 (1910).—Sumatra, Philippines.

93. *C. Loheri* C. B. Clarke in Journ. Linn. Soc. **37,** 14 (1904) ; Kükenth. 487.—Philippines.

94. *C. lateralis* Kükenth. in Engl. Pflanzenr. IV, **20,** 639 (1909).—Philippines, Java. (? S. India, ? Ceylon.)

95. *C. fascicularis* Soland. ex Boott in Hook. f. Fl. N.Z. **1,** 283 (1853).—*C. Pseudocyperus* var. *fascicularis* (Soland. ex Boott) Boott, Illustr. **4,** 141 (1867) ; Kükenth. 696.—*C. Pseudocyperus* L., C. B. Clarke, 16, partim.—Java, N. Guinea. (Queensland, N.S. Wales, S. Australia, Tasmania, N. Zealand.)

96. *C. baviensis* Franch. in Nouv. Arch. Mus. Hist. Nat. sér. 3, **10,** 77, t. 8 (1898) ; E. G. Camus in Lecomte, Fl. Gén. Indochine, **7,** 198 (1922).—*C. japonica* var. *chlorostachys* (Don) Kükenth., Kükenth. 620, partim.—Indo-China.

97. *C. Doniana* Spreng. Syst. **3,** 825 (1826).—*C. chlorostachys* D. Don in Trans. Linn. Soc. **14,** 330 (1825), *non* Steven.—*C. japonica* var. *chlorostachys* (Don) Kükenth. 620, partim.—Philippines, Java, N. Guinea. (Sikkim, Assam, China, Japan.)

98. *C. subtransversa* C. B. Clarke in Philipp. Journ. Sci. **2,** 108 (1907) ; Kükenth. 614.—Philippines, N. Guinea. (Japan.)

99. *C. montis-eeka* Hillebrand, Fl. Hawaiian Is. 486 (1888) ; Kükenth. 666.—Hawaii.

100. *C. nemostachys* Steud. in Flora, **29,** 23 (1846) ; Kükenth. 615.—Siam. (Assam, U. Burma, China, S. Japan.)

101. *C. oedorrhampha* Nelmes in Kew Bull. 1939, 659.—*C. tumida* Boott, Illustr. **1,** 66, t. 150 (1858) ; C. B. Clarke, 16 ; Kükenth. 615 ; *non* Beilschm.—Indo-China, Siam, Sumatra, Java. (Sikkim, Assam, Yunnan.)

102. *C. Brownii* Tuckerm. Enum. Meth. 21 (1843) ; Kükenth. 612.—N. Guinea. (Korea, Japan, N.S. Wales, Victoria.)

103. *C. olivacea* Boott in Proc. Linn. Soc. **1,** 286 (1846) ; C. B. Clarke, 15 ; Kükenth. 617.—? Indo-China, Sumatra, Java, Moluccas. (Sikkim, Assam, Japan.)

104. *C. chaetogyne* Nelmes (supra, p. 9).—Siam.

105. *C. fedia* Nees in Wight, Contrib. Bot. Ind. 129 (1834) ; Krecz. in Komarov, Fl. SSSR. **3,** 417 (1935).—*C. Wallichiana* Prescott in Wall. List Pl. E. Ind. Comp. Mus. 118 (1828), *nomen ;* Nees in Wight, Contrib. Bot. Ind. 129 (1834) ; C. B. Clarke 16 ; Kükenth. 749 ; *non* Spreng.—Indo-China, L. Burma. (Afghanistan, Himalayas, Assam, U. Burma, China).

106. *C. Maubertiana* Boott, Illustr. **1,** 45, t. 114 (1858).—*C. hebecarpa* var. *Maubertiana* (Boott) Franch. in Nouv. Arch. Mus. Hist. Nat. sér. 3, **10,** 70 (1898) ; Kükenth. 745.—Indo-China, Sumatra. (Nepal, Sikkim, Assam, China.)

107. *C. tricuspidata* Kükenth. in Engl. Bot. Jahrb. **70,** 466 (1940).—N. Guinea.

108. *C. neurochlamys* F. Muell. Fragm. **8,** 258 (1874).—*C. maculata* var. *neurochlamys* (F. Muell.) Kükenth. 428.—N. Caledonia, Samoa. (Queensland, N.S. Wales.)

109. *C. maculata* Boott in Trans. Linn. Soc. **20,** 128 (1846) ; Kükenth. 427.—Sumatra, Java. (S. India, Ceylon, Assam, Formosa, China, Japan.)

110. *C. elibates* Nelmes in Kew Bull. 1937, 353.—Malay Peninsula.

111. *C. philippinensis* Nelmes in Kew Bull. 1938, 109.—*C. Graeffeana* Boeck., C. B. Clarke, 5, partim ; Kükenth. 403, partim.—Philippines.

112. *C. exploratorum* Nelmes in Kew Bull. 1938, 108.—Borneo.

113. *C. Graeffeana* Boeck. in Flora, **58,** 123 (1875).—Fiji.

113a. *C. Graeffeana* var. *samoënsis* Nelmes in Kew Bull. 1938, 110.—? *C. Rechingeri* Palla in Oesterr. Bot. Zeitschr. **57,** 424 (1907).—Samoa.

114. *C. Stokesii* F. Brown in Bull. Bishop Mus., Honolulu, No. 84, 116 (1931).—Austral Is. : Rapa.

115. *C. feani* F. Brown in Bull. Bishop Mus., Honolulu, No. 84, 115 (1931).—Marquesas : Hivaoa.

116. *C. tahitensis* F. Brown in Occas. Papers, Bishop Mus., Honolulu, **9,** No. 4, 8 (1930).—Society Is. : Tahiti.

117. *C. savaiiensis* Kükenth. in Bull. Bishop Mus., Honolulu, No. 128, 24 (1935).—Samoa.

118. *C. Kerrii* Nelmes in Kew Bull. 1939, 304.—Indo-China.

119. *C. inverso-nervosa* Nelmes (supra, p. 11).—N. Caledonia.

120. *C. teres* Boott var. *spathulata* Kükenth. in Bull. Jard. Bot. Buitenz. sér. 3, **16,** 316 (1940).—Sumatra, Java.

121. *C. dimorpholepis* Steud. Synops. **2,** 214 (1855).—*C. cernua* Boott, Illustr. **4,** 171, t. 578 (1867) ; C. B. Clarke, 6 ; Kükenth. 353.—Indo-China. (Kashmir, Assam, Burma, China, Japan.)

122. *C. phacota* Spreng. Syst. **3,** 826 (1826) ; C. B. Clarke, 6 (sphalm. *C. phacodes*) ; Kükenth. 350.—L. Burma, Sumatra, Philippines, Java, N. Guinea. (Himalayas, S. India, Ceylon, Assam, U. Burma, Japan.)

123. *C. pruinosa* Boott in Proc. Linn. Soc. **1,** 255 (1845) ; C. B. Clarke, 7 ; Kükenth. 352.—Java, Moluccas. (Assam.)

124. *C. sandwicensis* Boeck. in Flora, **58,** 265 (1875) ; Kükenth. 366, partim.—Hawaii.

125. *C. crustacea* Nelmes (supra, p. 11).—*C. sandwicensis* Boeck., Kükenth. 366, partim.—Hawaii.

126. *C. Gaudichaudiana* Kunth, Enum. Pl. **2,** 417 (1837) ; C. B. Clarke, 6 ; Kükenth. 312.—*C. vulgaris* var. *Gaudichaudiana* (Kunth) Boott, Illustr. **4,** 169, t. 567 (1867).—N. Guinea. (Queensland, N.S. Wales, Victoria, S. Australia, Tasmania, N. Zealand.)

127. *C. lacerans* Kükenth. in Engl. Pflanzenr. IV, **20,** 326 (1909).—N. Guinea.

128. *C. appressa* R. Br. Prodr. Fl. N. Holl. 242 (1810) ; Kükenth. 178.—N. Guinea, N. Caledonia. (Queensland, N.S. Wales, Victoria, S. Australia, W. Australia, Tasmania, N. Zealand.)

129. *C. Thomsonii* Boott, Illustr. **1,** 1, t. 1 (1858) ; C. B. Clarke, 5 ; Kükenth. 143.—Indo-China. (Himalayas, Assam, China.)

130. *C. nubigena* D. Don in Trans. Linn. Soc. **14,** 326 (1825) ; C. B. Clarke, 5 ; Kükenth. 145.—*C. fallax* Steud. in Zoll. Verz. Ind. Archip. **1,** 60 (1854).—*C. nubigena* var. *fallax* (Steud.) C. B. Clarke, 5 ; Kükenth. 146.—Sumatra, Java. (Afghanistan, Himalayas, S. India, Ceylon, China.)

131. *C. divulsa* Stokes in With. Bot. Arrang. Brit. Pl. ed. 2, **2,** 1035 (1787) ; Kükenth. 162.—Java. (Europe, W. Asia, N. Africa, Madeira, Canary Is., Azores.)

132. *C. Pairaei* F. Schultz in Flora, **51,** 302 (1868).—*C. echinata* Murr., Kükenth. 160.—Java. (Europe, W. Asia, Madeira.)

133. *C. flaviceps* Kükenth. in Engl. Pflanzenr. IV, **20,** 133 (1909).—Hawaii.

134. *C. craspedotricha* Nelmes in Kew Bull. 1939, 657.—Siam. (China).

135. *C. alta* Boott in Proc. Linn. Soc. **1,** 254 (1845) ; C. B. Clarke, 6.—*C. remota* subsp. *alta* (Boott) Kükenth. 234.—*C. brizopyrum* Kunze, Suppl. Riedgr. 168, t.43 (1840–50).—*C. remota* subsp. *alta* var. *brizopyrum* (Kunze) Boeck. in Linnaea, **39,** 126 (1875) ; Kükenth. 234.—Sumatra, Java. (Himalayas, China.)

136. *C. Rochebrunii* Franch. et Savat. Enum. Pl. Japon. **2,** 126, 555 (1879).—*C. remota* subsp. *Rochebrunii* (Franch. et Savat.) Kükenth. 234, partim.—Sumatra. (China, Japan.)

137. *C. curta* Gooden. in Trans. Linn. Soc. **2,** 145 (1794).—*C. canescens* Linn., Kükenth. 216.—N. Guinea. (Europe, Asia, America, Australia.)

138. *C. pachystachya* Cham. ex Steud. Synops. Cyper. 197 (1855).—*C. macloviana* D'Urv., Kükenth. 195.—Hawaii. (W.N. America, Alaska, Aleutian Is.)

GOMPHRENA CELOSIOIDES MART., A WEED SPREADING IN THE OLD WORLD TROPICS.

N. Y. SANDWITH.

A weedy species of *Gomphrena* with oblong or ovoid white heads, which become narrowly cylindric as the lower flowers fall, has been introduced from America into Africa, Asia and Australia, and is spreading rapidly in grass and on roadsides. Specimens have usually been identified as *G. decumbens* Jacq. or, more recently, as *G. dispersa* Standley, species which have been clearly defined by Standley in Contr. U.S. Nat. Herb. xviii. 91–92 (1916) and N. Amer. Fl. xxi, 147–150 (1917). A re-examination of the material, and of a specimen from Java, where the plant is " wild " all over the Botanic Garden at Buitenzorg, showed that this *Gomphrena* can be referred neither to *G. decumbens* nor to *G. dispersa* but is *G. celosioides* Mart., a species of S. Brazil, Paraguay, Uruguay and Argentina. This conclusion is confirmed by the identification of numerous South African specimens of the same plant with *G. celosioides* by Dr. K. Suessenguth, see Fedde Rep. Spp. Nov. XXXV. 309 (1934). One of the collections cited (in error, as "2796") by Suessenguth, *Schlechter* 2769, from Durban, is represented in the Kew Herbarium. Since Martius' type material (coll. *Sellow*) is in the Munich Herbarium, where Dr. Suessenguth is Conservator, there can be little doubt of the accuracy of this identification, apart from the evidence of the description and figure given by M. Seubert in Mart. Fl. Bras. V. pars i, 218, t.66 (1875), and the presence at Kew of specimens collected by Sellow.

G. celosioides Mart. is immediately distinguished from both *G. decumbens* Jacq. and *G. dispersa* Standl. by the very narrow, often obscure, and entire or scarcely toothed crest on the keel of the bracteoles, which is broadest and appears to rise at some distance below the sharply acute apex. Moreover, *G. decumbens*—beautifully figured by Jacquin in Hort. Schoenbr., t. 482 (1804)—differs in having the bracteoles often tinged with pink, and much longer than the flowers ; while *G. dispersa* has the conspicuous crests of the bracteoles widest at or near the apex so that the flowers have an obtuse facies. Each of these species has a more northern distribution in tropical America, mainly in Mexico and Central America, and around the Caribbean Sea.

Old World specimens of *G. celosioides* have been seen from India (Dehra Dun, *Parker* ; Madras, " spreading rapidly as a roadside weed," *Gamble* 12032) ; Java (Buitenzorg, *van Steenis*) ; Australia (Queensland, *Everist* 350, *Hubbard* 6520 ; New South Wales, *Millard*) ; Tropical Africa (many specimens from the Belgian Congo, Uganda, Kenya, Tanganyika, Zanzibar, Portuguese East Africa, Rhodesia) ; South Africa (specimens from Transvaal, Natal) ; South West Africa (*Dinter* 8002).

An obvious synonym of this plant is *Gomphrena alba* Peter in Fedde, Beihefte, Band XL, 2, Anhang p. 64, t.32 f.2, which was described from specimens collected in Tanganyika.

The plant provisionally identified as *G. decumbens* Jacq. in Gamble, Fl. Madras, part vii, 1179 (1925) is *G. celosioides ;* while the *G. decumbens* Jacq. var. *genuina* Stuchlik of Burtt Davy, Man. Fl. Pl. and Ferns of Transvaal, part i, 185, f.20 (1926), is also this species, as is the *G. globosa* L. ssp. *africana* Stuchlik of Beih. zum Bot. Zentralblatt, XXX. Abt. 2, p. 396 (1913). The reduction of the latter name was duly made by Suessenguth (l.c.). There can be no possibility of confusion of *G. celosioides* with the garden favourite and cosmopolitan weed *G. globosa* L., "Globe Amaranth" or "Bachelor's Button," which has wider, globose, variously coloured heads.

REVIEW

Plants and Plant Science in Latin America.—An extremely interesting volume* of papers in English, French, or Spanish, by various authors, partly published here for the first time and partly re-printed from *Chronica Botanica,* has been edited by Dr. F. Verdoorn. The very nature of the work makes an adequate review impossible in a short space. An introductory essay by the editor raises many questions regarding the status of the botanist in the world in general and in America in particular. Bibliographical references will be of considerable value to anyone working on the flora or vegetation of Latin America. Problems of Tropical American Agriculture and economic plants are outlined. A valuable phytogeographic sketch of Latin America by A. C. Smith and I. M. Johnston is accompanied by an outline map and illustrated by a series of reproductions mostly from published works.

Most of the papers deal with the vegetation and/or flora of more restricted areas. Thus there are accounts of the plant life of Honduras, El Salvador, Nicaragua, Costa Rica, the Panamas, Cuba, Jamaica, Hispaniola, Puerto Rica, the Lesser Antilles, Trinidad and Tobago, Venezuela, British Guiana, Surinam, Brazil, Peru, Paraguay, Argentina, Uruguay, Chile, Galapagos Is., Juan Fernandez and Desventuradas Is., Guatemala, Ecuador, Colombia, Bolivia, and the Falkland Is. There are also accounts of the climate, geology, soils, pathology, economic crops, forestry, ethnobotany, palaeobotany, and cytogenetics of Central and South America or of their native and cultivated plants. A list of the location of botanical collections, arranged according to countries, and a supplement of plant science institutions, stations, museums, gardens, societies, and commissions in Central and South America will be of great use for reference.

W. B. TURRILL.

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* "Plants and Plant Science in Latin America." Edited by F. Verdoorn, Chronica Botanica Company, Waltham, Mass, U.S.A., 1945, pp. 384, $6.

ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS : XIX*.

H. N. RIDLEY.

MELASTOMATACEAE

Anplectrum monticola *Ridley*, sp. nov., nulli speciei arcte affinis, foliis parvis coriaceis retusis rigide coriaceis, paniculis brevibus in axillis superioribus sitis ab omnibus differt.

Frutex, ramis lignosis vix 3 mm. crassis purpureis pilis furfuraceis atris tectis, internodiis 5 mm. longis. *Folia* approximata, coriacea, elliptica, apicibus retusis, basibus cuneatis, glabra, subtus pallidiora, 1-1·5 cm. longa, 5-7 mm. lata, nervis 2 subtus cum costa, elevatis ; petioli 3 mm. longi, furfuracei. *Paniculae* axillares, furfuraceae, 2 cm. longae, pendunculis 1 cm. longis. *Flores* 5 vel 6, in apicibus subumbellati. *Bracteae* oblongae, obtusae, 5 mm. longae. *Pedicelli* 3 mm. longi. *Calyx* urceolatus, 3 mm. longus, furfuraceus, margine sinuato. *Petala* 4, lanceolata, acuminata, 3 mm. longa. *Stamina* 8, inaequalia, antheris oblongis, appendicibus basalibus pallidis. *Stylus* longior, cylindricus. *Bacca* globosa, pustulata.

SARAWAK. Summit of Benkaran, *C. J. Brooks* 50.

This very curious plant is quite unlike any other species in its densely set, small, coriaceous leaves and short axillary panicles. The young parts are covered with sooty scurfy processes and the young leaves gland-dotted beneath.

Anplectrum macrophyllum *Ridley*, sp. nov., ab *A. latifolio* Triana et *A. Beccariano* Cogn., quibus affine, foliis chartaceis cum tota planta omnino glabris differt.

Frutex scandens, glaber. *Folia* chartacea, ovata, acuminata, basi cordata, 15–17 cm. longa, 11–13 cm. lata, nervis subtus elevatis 3-jugis, nervis transversis dissitis subtus elevatis, marginibus sinuatis sparse denticulatis ; petioli 1·5 cm. longi. *Panicula* terminalis, 30 cm. longa, pedunculo 10 cm. longo, ramis dissitis oppositis 3–7 cm. longis. *Bracteolae* ovatae, acutae, 1 mm. longae. *Pedicelli* 5 mm. longi, scabridi. *Calyx* urceolatus, scabridus, 5 mm. longus, 3 mm. latus, limbo sinuato sub-4-lobo. *Petala* 4, rotundata, late ovata, 5 mm. longa, 5 mm. lata. *Stamina* longe acuminata, 4 exteriora 1 cm. longa, tuberculis minutis dorsalibus instructa, 4 interiora 7 mm. longa, subsimilia. *Stylus* validulus, 1·5 cm. longus.

SARAWAK. Pata river, *Hose* 478.

This is allied to *A. latifolium* Triana but has much thinner leaves and is altogether glabrous.

Anplectrum cyanocarpum *Bl.*

SARAWAK. Sarawak river at Pengkulu Ampat, edge of old jungle, *Haviland* 69. " Climber or straggler. Petals pale pink."

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* Continued from K.B. 1940, 262.

This plant has been found also by *C. B. Kloss* in Pulau Tiuman, an island off the east coast of Johor. Hitherto it has only been recorded from Java.

Anplectrum lepidoto-setosum *King.*

SARAWAK. Limbang, berry blue, *Haviland* 544 ; Matang, *Ridley* 12253.

New record for Borneo.

Dissochaeta porphyrocarpa *Ridley*, sp. nov., a *D. hirsuta* Hook. fil., cui affinis, bracteis spathulatis angustis, floribus roseis, filamentis longioribus, stylo longiore uncato, baccis majoribus differt.

Frutex scandens, ramis dense setosis, setis brevibus rigidis sursum curvatis. *Folia* ovata vel lanceolata, subcoriacea, superne setosa, acuminata, obtusa, basibus subcordatis, subtus dense setosa, 11–12 cm. longa, 3·3–6·3 cm. lata, costa et nervis subtus elevatis parallelis subremotis saepe anastomosantibus ; petioli 5 mm.–1 cm. longi, dense setosi. *Panicula* terminalis, 12–14 cm. longa, erecta, setosa, ramis paucis 6 cm. longis. *Bracteae* elongatae, anguste spathulatae, 7 mm. longae, superne 1 mm. latae. *Pedicelli* 4 mm. longi, setosi. *Calyx* urceolatus, setosus, 7 mm. longus, lobis lanceolatis acuminatis extra setosis. *Petala* 4, rosea, triangulari-ovata, bisetosa, 5 mm. longa. *Stamina* 8, longiora filamentis 3 mm. longis antheris cylindricis acuminatis sigmoideis 7 mm. longis, minora filamentis brevioribus antheris paullo minoribus praedita. *Stylus* 1·2 cm. longus, superne incrassatus, curvus, apice uncato. *Bacca* urceolato-ovoidea, setosa, 1·5 cm. longa.

BRIT. N. BORNEO. Ulu Tawaran, 2,000 ft. alt., young jungle, petals pink, *Haviland* 1287 ; Tampassuk, near Kiau, 3,500 ft. alt., fruits purple, *Haviland* 1288.

This plant was referred by Stapf (in Trans. Linn. Soc. Bot. **4**, 159) to *D. hirsuta* Hook. fil., which was based on a plant, collected by *Motley* in Labuan, of which at that time the flowers were unknown. It is undoubtedly allied to that species, but is very distinct not only in the large flowers and fruits and the pink petals but in the long filaments, narrow spathulate bracts and long hooked style.

Dissochaeta densiflora *Ridley*, sp. nov., *D. annulatae* Hook. fil. affinis, floribus plus dimidio minoribus differt.

Frutex scandens, pilis stellatis ferrugineis setis atris mixtis dense tectus. *Folia* coriacea, superne glabra, subtus pilis stellatis tecta, ovata vel ovato-lanceolata, breviter obtuse acuminata, basibus rotundatis subcordatis, 5–8 cm. longa, 3–4·5 cm. lata, nervis supra immersis subtus elevatis 3-jugis ; petioli pilis stellatis dense tecti, 5 mm. longi. *Panicula* terminalis, densa, multiflora, 10 cm. longa (pedunculo 5 cm. longo), ramis 2 cm. longis approximatis, pilis stellatis pallidis dense tecta. *Bracteae* oblongae, pilosae, setis atris marginatae, 2 mm. longae. *Pedicelli* brevissimi. *Calyx* urceolaris, superne angustatus, pilis pallidis stellatis dense tectus, lobis 4 ovatis obtusis setis atris terminatis, 4 mm. longus. *Petala* 4, lanceolata, acuminata, rosea, seta atra terminata. *Stamina* 8 : 4 linearia, longe acuminata, appendice basali flava bifurcata ; 4 subsimilia breviora, mutica. *Stylus* filiformis, 4 mm. longus, apice ovarii hirto.

SARAWAK. Saribas, *Haviland* 1550.

Dalenia furfuracea *Ridley*, sp. nov., a *D. speciosa* Korth., cui affinis, planta tota ferrugineo-furfuracea, foliis oblongis vel elliptico-ovatis, panicula majore patula, staminibus minoribus appendiculatis majoribus muticis differt.

Frutex scandens, gracilis, ferrugineo-furfuraceus, ramis 4-angulatis. *Folia* coriacea, superne costa depressa excepta glabra, subtus ferrugineo-furfuracea, elliptico-ovata vel oblonga, cuspidata, basibus rotundatis, 15 cm. longa, 7–11 cm. lata, nervis 3-jugis valde elevatis, nervis transversis elevatis parallelis, reticulationibus elevatis ; petioli crassi, torti, ferrugineo-furfuracei, 2 cm. longi. *Stipulae* lobatae, 5 mm. longae. *Paniculae* oppositae, axillares, 15 cm. longae, ramis 4–6 cm. longis oppositis, ramulis 1–2 cm. longis oppositis, omnino ferrugineo-furfuraceae. *Pedicelli* 6 mm. longi. *Flores* penduli. *Calyx* basi ovoideo-globosus, 6 mm. longus, limbo cylindrico deciduo 5 mm. longo, furfuraceus. *Petala* 4, lanceolata, acuminata, rosea. *Stamina* 8 : 4 cum filamentis crassiusculis antheris oblongo-linearibus exappendiculatis, 4 alternis brevioribus antheris lanceolatis processubus anticis basalibus lanceolatis apicibus filiformibus. *Stylus* breviusculus, crassiusculus.

SARAWAK. Pengkulu Ampat, in old jungle, petals pink, *Haviland* 144 ; Matang, *Ridley* 12259.

That this plant is a *Dalenia* I have no doubt, as the upper part of the calyx is deciduous, but the stamens are not quite similar to those of *D. speciosa* Korth. as figured by the author, the larger series having no appendages, while the smaller ones have narrow lanceolate processes passing into filiform tips. What I take to be Korthals' *D. speciosa* is a " straggling shrub, berries blue " collected by *Haviland* at Rejang Kapit, but I have seen no flowers of it.

Phaulanthus acuminatissimus *Ridley*, sp. nov., a *Ph. pedunculato* Craib, cui affinis, caule subherbaceo, foliis majoribus longe acuminatis differt.

Suffrutex, caule lenticellato. *Folia* herbacea, opposita, ovato-lanceolata, longe acuminata, basibus obtusis, superne pustulata, 17–21 cm. longa (acumine 1–3 cm. longo), 6·3–9 cm. lata, nervis 3-jugis, jugis 2 basalibus jugo 1 in costa decurrente, nervulis transversis pluribus, reticulationibus laxis ; petioli 4·5–5·5 cm. longi. *Racemi* axillares, 5 mm. longi, setis paucis tecti. *Flores* parvi, 3 vel 4, subsessiles, axillares. *Calyx* urceolaris, 2 mm. longus, squamis acutis tectus, lobis 4 cylindricis subacutis glabris 1 mm. longis. *Petala* 4, brevia, lanceolata, acuminata. *Stamina* 8, subaequalia, subsimilia, antheris cylindricis acuminatis appendice minuta dorsali, filamentis linearibus. *Stylus* brevis, cylindricus. *Ovarium* 8-angulatum. *Bacca* 3 mm. longa, squamata.

SARAWAK. Mt. Trekan, 1,000 ft. alt., *Hose* 640.

This species is chiefly conspicuous for its very long-acuminate leaves. It is more glabrous than most species of the genus, but has the elongated scale-like trichomes on the inflorescence possessed by other species.

Blastus hispidissimus *Ridley*, sp. nov., a *B. Cogniauxii* Stapf indumento diverso, petalis acuminatis, calyce campanulato, ovario hirto differt.

Fruticulus omnino hirtus, ramis gracillimis. *Folia* inaequalia, herbacea, undique setoso-hirta, ovato-lanceolata, acuminata, basibus inaequilateralibus lobis rotundatis, 12 cm. longa, 4 cm. lata, minora 2–7·5 cm. longa, 5 mm.–2 cm. lata, nervis 7, nervulis transversis horizontalibus remotis ; petioli 2 mm. longi, hirti. *Cymae* hirtae, axillares, pedunculis gracilibus 3·5 cm. longis. *Flores* parvi, per 4–7 in apicibus pedicellorum 1 cm. longorum subumbellati. *Bracteae* binae, minutae. *Calyx* campanulatus, longe hirtus, 2 mm. longus, lobis 4 dentiformibus. *Petala* 4, lanceolata, acuminata. *Stamina* 4, antheris oblongo-linearibus obtusis quam filamenta longioribus. *Ovarium* globosum, hirtum. *Stylus* glaber.

SARAWAK. Entoyut river, *Hose* 161.

Driessenia hirta *Ridley*, sp. nov., a *D. crystallina* Stapf, cui affinis, foliis sessilibus marginibus sinuatis, paniculis hirtis differt.

Herba gracilis, hirta. *Folia* herbacea, superne setis paucis exceptis glabra, subtus in nervis puberula et setifera, sessilia, inaequalia, late lanceolata, longe acuminata, basibus rotundatis, marginibus sinuatis, majora 15–18 cm. longa, 4·5–8 cm. lata, 7-nervia, minora 5·5–8 cm. longa, 2–3 cm. lata, 5-nervia. *Paniculae* hirtae, axillares, furfuraceae, 5 cm. longae. *Pedicelli* 1 mm. longi. *Calyx* campanulatus, hirtus, 3 mm. longus, lobis minutis dentiformibus. *Petala* 4, minuta, oblonga. *Stamina* 8, filamentis filiformibus, antheris lineari-oblongis acuminatis curvis 2 mm. longis, appendicibus bifurcatis ¼ mm. longis. *Stylus* breviusculus, filiformis. *Capsula* ovoidea, 2 mm. longa.

SARAWAK. Rejang, Belaga, *Haviland* 3140.

This is perhaps most nearly allied to *D. crystallina* Stapf, but the general hairiness and the almost or quite sessile leaves distinguish it at once.

Anerincleistus ovatus *Ridley*, sp. nov., ab *A. glomerulato* King, cui affinis, foliis multo majoribus ovatis basi rotundatis, paniculis laxioribus differt.

Frutex, ramis setis appressis tectis. *Folia* herbacea, superne setis paucis dissitis exceptis glabra, subtus pallida, setosa, costa nervisque densissime tectis, ovata, acuminata, acuta, basibus rotundatis vel obtusis, 18–21 cm. longa, 10–12 cm. lata, nervis 3-jugis, jugis 2 e basi, jugo 1 e costa exortis ; petioli densissime setosi, 5–9·5 cm. longi. *Paniculae* subterminales, 15 cm. longae, pedunculo dense setoso, ramis paucis brevibus suboppositis 0·5–1 cm. longis, floribus congestis. *Bracteae* lanceolatae, densissime setosae, caducae, 3 mm. longae. *Pedicelli* vix 1 mm. longi. *Calyx* campanulatus, scabrido-setosus, 2 mm. longus, lobis 4 brevissimis obtusis. *Petala* 4, ovata, obtusa, minuta. *Stamina* 8, filamentis filiformibus 1 mm. longis, antheris oblongis obtusis rubris 2 mm. longis. *Stylus* filiformis, crassiusculus, sigmoideus. *Capsula* campanulata, lobis oblongo-quadratis truncatis.

SARAWAK. Mt. Matang, 2,000 ft. alt., *Haviland* 38 (type) ; Po Point, *Haviland* 1908 ; Limbang, *Hose* 745 ; Mt. Trekan, 2,000 ft. alt., *Hose* 745.

This is allied to *A. glomerulatus* King, but has very much larger leaves, ovate in shape.

The species included under the genus *Anerincleistus* by Cogniaux and King, *A. glomerulatus*, *A. Beccarii* Cogn., *A. monticola* Sm., are much more like *Allomorphia* than like *An. hirsutus* Korth., the generic type, differing indeed mainly in the inappendiculate stamens. The inflorescence is practically terminal in all.

Sonerila begoniifolia *Bl.*

DUTCH BORNEO. S. and E. Division : Banjermasin, on shady wet rocks, *Motley* 1111. New record.

This species is usually referred to *S. moluccana* Roxb., but the description of that is far too incomplete to be of any use in identification, and I have seen no species of the genus from the Moluccas.

Sonerila matangensis *Ridley*, sp. nov., a *S. begoniifolia* Bl., cui affinis, foliis undique molliter velutino-hirsutis lanceolatis acuminatis, capsulis verrucosis papillis parvis hirtis tectis differt.

Herba. Caulis dense velutino-hirtus, 5–9 cm. longus, 3 mm. crassus, simplex vel superne biramosus. *Folia* herbacea, majora lanceolata, acuminata, obtusa, dense velutino-hirta, basibus inaequaliter bilobis lobo inferiore rotundato 5 mm. longo, 6·5–8·5 cm. longa, 3–3·5 cm. lata, nervis tenuibus 3-jugis, nervulis parallelis remotis, petiolis dense velutino-hirtis 1 cm. longis ; folia minora ovata vel rotundata, acuta, 4 mm. longa. *Racemus* dense hirtus, floribus 2–5. *Calyx* obconicus, hirtus, 2 mm. longus. *Petala* 3, ovata, acuminata, rosea, parce hirta, 3 mm. longa. *Stamina* 4, filamentis petalis brevioribus, antheris oblongis obtusis una breviore, processu elongato attenuato e basi dorsali exorto. *Capsula* campanulata, verrucis parvis capillis terminatis tecta, 5 mm. longa, 5 mm. lata, pedicello crassiusculo 4 mm. longo.

SARAWAK. Mt. Matang, *Haviland* 1049 (type), *Ridley* s.n.

This plant appears to be confined to Mt. Matang and differs from *S. begoniifolia* Bl. in its lanceolate softly hairy leaves, and in the very small warts on the fruit, each of which bears a terminal hair.

Sonerila tetraptera *Stapf* mss., descr. *Ridley*, sp. nov., a *S. calophylla* Ridley, cui affinis, antheris brevibus truncatis, floribus minoribus paucioribus, capsulis brevioribus differt.

Herba 8–15 cm. alta. *Caulis* tetragonus, basi tetrapterus, alis setis adscendentibus munitis. *Folia* carnosa, aequalia, obovata, basibus attenuatis acutis, apicibus rotundatis, marginibus integris vel denticulatis, superne setis sparse munita, subtus glabra, purpurea, 1–3 cm. longa, 1–1·5 cm. lata, nervis 1-jugis saepius obscuris ; petioli 2 mm. longi. *Pedunculus* 4 cm. longus, tetragonus, ruber, setiger. *Flores* usque ad 3, pedicellis brevibus hirtis. *Calyx* 2 mm. longus, urniformis, hirtus, dentibus acutis brevibus. *Petala* lanceolata, alba, acuta, 4 mm. longa. *Stamina* 3, breviora, antheris oblongis truncatis biporosis glabris. *Capsula* campanulata, dense minute pustulata, pustulis breviter setosis, 5 mm. longa, 4 mm. lata pedicello 4 mm. longo setoso.

SARAWAK. Mt. Bongo, near Tegora, *Haviland* 2071 : " herb, leaves pinkish, petals white."

This resembles *S. calophylla* Ridley, of Kedah Peak, but the flowers are smaller, the capsules fewer and shorter and the anthers short and truncate.

Sonerila nana *Ridley*, sp. nov., a forma parvula *S. pictae* Korth., cui affinis, foliis ovatis supra setosis, floribus multo minoribus, capsula longiore differt.

Herba pusilla. *Caulis* puberulus, 8–11 cm. altus, adscendens. *Folia* aequalia, ovata, obtusa vel acuta, basibus acutis, supra parce setosa, marginibus serrato-setosis, subtus costa nervisque 2-paribus puberulis exceptis glabra, 2·2 cm. longa, 1–1·5 cm. lata ; petioli puberuli, 5 mm. longi. *Racemus* 1 cm. longus, 4-florus. *Calyx* parce setosus, puberulus, anguste urceolatus, lobis triangularibus acutis. *Petala* rosea, lanceolata, acuta, 5 mm. longa. *Stamina* 3, subaequilonga, filamentis gracilibus, antheris lanceolatis acuminatis basibus sagittatis. *Stylus* filiformis, subaequilongus, stigmate minute capitato. *Capsula* campanulata, laevis, 5 mm. longa, 4 mm. lata, pedicello 6 mm. longo. *Semina* oblanceolata, glandulifera, 0·5–0·6 mm. longa, alis spathulatis.

SARAWAK. Quop, petals pink, *Haviland* 542, 2209.

The only species I know really allied to this is *S. picta* var. *concolor* Ridl., a dwarf variety, but the flowers are much smaller, the leaves distinctly ovate, hardly lanceolate, and armed with bristles above. The description of the seeds I have taken from Stapf's drawing in Herb. Kew.

Sonerila grandis *Ridley*, sp. nov., species maxima, *S. repenti* King affinis, sed foliis magnis ovatis cordatis, cymis longis multifloris differt.

Herba glabra. *Caulis* ruber, succulentus, 19 cm. longus. *Folia* opposita, aequalia, herbacea, supra setis dissitis brevibus tecta, subtus glabra, ovata, acuminata, acuta, basibus rotundatis cordatis, marginibus denticulatis setosis, 13–18 cm. longa, 5·5–14 cm. lata, nervis 7, nervulis transversis usque 30 remotis 3 mm.–1 cm. distantibus ; petioli glabri, 5–9 cm. longi. *Cymae* axillares, glabrae, pedunculis 7·5 cm. longis, ramis terminalibus 2 divaricantibus 3 cm. longis, floribus secundis erectis 22 in ramo, pedicellis 2 mm. longis. *Calyx* anguste urceolatus, purpureus, 3 mm. longus, lobis brevibus ovatis obtusis. *Petala* 3, ovata, rosea, 4 mm. longa. *Stamina* 3, filamentis filiformibus 3 mm. longis, antheris longe acuminatis basibus sagittatis 6 mm. longis. *Capsula* obconica, angulata, glabra, laevis, dense minute punctata, 5 mm. longa, 4 mm. lata, pedicello 4 mm. longo.

SUMATRA. Padang Panjang, Jan. 1913, *C. G. Matthew*.

The biggest species I have seen : the leaves resemble those of *Phyllagathis*. The cyme consists of two divaricating branches bearing two rows of erect flowers on the upper edge. It is glabrous except for some scattered clubbed hairs.

Sonerila pusilla *Ridley*, sp. nov., a formis nanis *S. begoniifoliae* Bl., cui affinis, foliis carnosis ellipticis obtusis subglabris differt.

Herba pusilla, caule simplici setis appressis tecto 2 cm. longo. *Folia* 3, crassiuscule herbacea, supra glabra, papillosa, elliptica, inaequilateralia, obtusa, basibus angustatis inaequaliter bilobis, marginibus setiferis, 2–2·5 cm. longa, 1·1–2 cm. lata, nervis 5 subtus appresse hirtis ; petioli 3 mm. longi, appresse setosi. *Flores* non visi. *Capsulae* campanulatae, pustulatae, 5 mm. longae, 5 mm. latae, 3 vel 4 in racemo brevissimo, pedicellis 5 mm. longis appresse setigeris.

SARAWAK. Mt. Matang, *Ridley*, s.n.

I never succeeded in finding flowers of this little plant and have never seen other specimens. The leaves are fleshy, elliptic, rounded, very unequal-sided and blunt, and except for the nerves and edges which bear setae are quite glabrous. On the wider half are 2 nerves, on the other 1 only.

Sonerila minima *Stapf* mss., descr. *Ridley*, sp. nov., *S. pusillae* Ridley affinis, sed planta multo minor, nervis foliorum paucioribus, capsula longe hirsuta differt.

Herba 5 mm.–2 cm. alta, caule hirto. *Folia* inaequalia, majora ovata vel oblonga, obtusa, basibus inaequilateralibus, lobis rotundis, subtus hirta, marginibus hirtis, 5 mm.–1·6 cm. longa, 5–7 mm. lata, nervis e basi folii 2, e costa 2 ; petioli 3 mm. longi, rufo-hirti ; folia minora cordata, ovato-rotundata, subacuta, 2 mm. longa. *Flores* non visi. *Capsula* solitaria, campanulata, hirta, apicem versus punctata, 3 mm. longa, 4 mm. lata, pedicello crassiusculo hirto 5 mm. longo.

SARAWAK. Mt. Dulit, 3–4,000 ft. alt., *Haviland & Hose* 3203.

Certainly the smallest species of *Sonerila* I know, belonging to the affinity of *S. begoniifolia* Bl. and *S. pusilla* Ridley, but very much reduced

Sonerila nervulosa *Ridley*, sp. nov., a *S. Beccariana* Cogn., cui affinis, floribus multo minoribus, antheris oblongis obtusis, foliis multo minoribus obtusis differt.—*S. borneënsis* var. *setulosa* Stapf in Trans. Linn. Soc. Bot. **4,** 158 (1894).

Herba adscendens, caule basi lignoso superne pilis setiformibus tecto 5–10 cm. alto. *Folia* inaequalia, majora oblongo-obovata, obtusa vel breviter acuminata, basibus inaequaliter bilobis, lobo majore rotundato, utraque pagina setis sparsis munita, 5·5–10 cm. longa, 2·5–4 cm. lata, nervis 4–5 subtus dense hirtis, nervulis transversis remotis subtus conspicuis ; petioli dense setoso-hirti, 5 mm.–1 cm. longi ; folia minora rotundata, cordata, setosa, 4 mm. longa. *Racemi* breves, axillares, 3–4-flori, dense hirti, pedicellis 2 mm. longis. *Calyx* campanulatus, hirtus, 3 mm. longus, lobis dentiformibus. *Petala* rosea, lanceolata, sparse setosa, 4 mm. longa. *Stamina* 3, filamentis brevibus linearibus, antheris oblongis obtusis quam petala brevioribus. *Stylus* brevior, crassiusculus, stigmate capitato. *Capsula* campanulata, basi lata, dense minute papillosa, hirta, 5 mm. longa, 4 mm. lata.

SARAWAK. Mt. Trekan, 2,000 ft. alt., *Hose* 639, 647 (type).

BRIT. N. BORNEO. Mt. Kinabalu, 3,000 ft. alt., *Haviland* 1285.

Var. **hirsutissima** *Ridley*, var. nov. foliis utrinque hirtis, capsula longe hirta.

SARAWAK. Mt. Murud, at foot of mountain, *Moulton* 170.

Hose's specimens 647 are much larger than those numbered 639, from the same locality, and the Kinabalu plant (the type of Stapf's *S. borneënsis* var. *setulosa*), but it is clear that these plants all belong to one species, the latter forms being dwarf plants. In some of Hose's specimens the young leaves are densely hairy as they all are in the variety.

Allomorphia auriculata *Ridley*, sp. nov., ab *A. longispicata* Cogn., cui affinis, foliis lanceolatis longe acuminatis auriculatis, calyce parvo cupulato differt.

Suffrutex, caule lignoso brunneo ultra 7 cm. longo. *Folia* herbacea, glabra, lanceolata, longe acuminata, acuta, basibus in petiolos decurrentibus truncatis auriculatis, 14–20 cm. longa, 5–7 cm. lata, nervis 5 subtus elevatis, nervulis transversis remotis, reticulationibus laxis majusculis ; petioli 1·5–3 cm. longi. *Racemus* simplex vel ramo unico praeditus, lateralis, gracilis, 27 cm. longus, furfuraceus. *Flores* parvi, pauci, in racemulis binis 2 mm. longis 1·5 cm. remotis dispositi. *Pedicelli* graciles, 1 mm. longi. *Calyx* cupulatus, 2 mm. longus, furfuraceus. *Petala* 4, triangularia, rostrata, flava, 2 mm. longa. *Stamina* 8, similia, petala superantia, antheris lineari-oblongis obtusis inappendiculatis. *Stylus* vix longior. *Capsula* campanulata, pallida, 2 mm. longa, valvis 4 rotundatis, pedicellis 5 mm. longis crassis.

SARAWAK. Upper Baram, Gunong Temabok, *Moulton* 6866. Foot of Mt. Murud, flowers yellow, *Moulton* 130 (type).

This appears to be most closely allied to *A. longispicata* Cogn., collected in Sarawak by Beccari, which I have not seen but which, from the description, differs in the short cylindric non-furfuraceous calyx and elliptic-ovate obtuse leaves. The leaves are decurrent on the petiole, ending at the base in two short blunt auricles.

Phyllagathis peltata *Stapf*, mss., descr. *Ridley*, sp. nov., a *P. hirsuta* Cogn., cui affinis, foliis integris peltatis, petiolis glabris differt.

Herba, caule brevi glabro lignoso. *Folia* herbacea, ovata, peltata, cuspidata, supra glabra, subtus nervis 5 cum nervulis transversis remotis elevatis cum reticulationibus setis rigidis flavis munitis, marginibus incrassatis setosis, 12–13 cm. longa, 6·5–10 cm. lata; petioli glabri, 11–14 cm. longi. *Scapus* 15–17 cm. longus, glaber. *Umbella* 4-ramosa, floribus usque 9. *Calycis lobi* oblongi, spinis acutis. *Petala* et *stamina* non visa. *Capsula* obconica, truncata, laevis, calyce brevior, 5 mm. longa, 3 mm. lata, pedicello 5 mm. longo. *Semina* minuta, obcuneata, truncata, laevia.

SARAWAK. Baram, Mt. Dulit, 3–5,000 ft. alt., *Haviland & Hose* 3205.

This species (unfortunately only a ripe fruiting specimen has been procured) is allied to *P. hirsuta* Cogn., but is quite glabrous except for the setose back and edges of the leaves, and the leaves are completely peltate.

Medinilla muricata *Bl.*

SARAWAK. Sine loc., *Beccari* 570. Busau, limestone, *Haviland* 68; Sarawak River, *Haviland* "b.p.t.a."

New record for Borneo.

Medinilla laxiflora *Ridley*, sp. nov., a *M. longipedunculata* Cogn., cui affinis, foliis petiolatis lanceolatis cordatis, floribus majoribus differt.

Frutex epiphyticus, ramosus, ramis pallidis dense verrucosis. *Folia* tenuiter coriacea, lanceolata, longe acuminata, acuta, basibus rotundatis cordatis quinquenerviis, 11–15 cm. longa, 3–5·5 cm. lata, nervis 5, nervulis transversis tenuibus anastomosantibus; petioli 1 cm. longi, rugosuli. *Paniculae* axillares, elongatae, laxae, glabrae, pedunculis rubris gracilibus 3–4 cm. longis, ramis gracilibus flexuosis 4 vel 5 in apicibus umbellatis 2–8 cm. longis, internodiis 1 cm. longis. *Bracteae* ovatae, acutae, 1 mm. longae, oppositae, persistentes. *Pedicelli* rubri, sub anthesin 1 mm. longi, sub fructu 6 mm. longi. *Calyx* campanulatus, 3 mm. longus, margine sinuato vix lobato. *Petala* 5, oblonga, obtusa, unguiculata, 5 mm. longa, alba. *Stamina* 10, antheris elongatis cylindricis acuminatis, tuberculis basalibus 2 dentiformibus. *Stylus* brevior, gracilis, stigmate capitato.

SARAWAK. Near Kuching, *Haviland* 1529K : " Growing on a large tree. Peduncles and pedicels red. Calyx waxy, pinkish white. Petals white."

Medinilla vulcanica Ridley in Journ. As. Soc. Mal. **1,** 61 (1923). I find that this name was anticipated by Merrill for a Philippine plant in 1917, so I herewith alter it to **Medinilla dumosa** *Ridley,* nom. nov., as it forms dense low thickets on the rocks of the Sibuyak volcano in Sumatra.

Medinilla Matthewi *Ridley,* sp. nov., a *M. penduliflora* Ridley, cui affinis, nervis foliorum pluribus, nervulis transversis conspicuis, panicula furfuracea, petalis rotundatis differt.

Frutex, caule pustulato. *Folia* coriacea, elliptica, basibus obtusis, 10–16 cm. longa, 5·5–8 cm. lata, nervis 5-jugis elevatis, nervulis transversis remotis conspicuis ; petioli crassi, 4 mm. longi. *Panicula* pendula, furfuracea, penduncculis 8·5 cm. longis, ramis in apice congestis umbellatis 3 cm. longis, ramulis umbellatis saepius 3 in ramo 1 cm. longis. *Bracteae* minutae, lanceolatae, acuminatae. *Calyx* campanulatus, 3 mm. longus, margine sinuato obscure lobato. *Petala* 5, late rotundato-ovata, alba, 6 mm. longa, 4 mm. lata. *Stamina* 10, similia, filamentis 2 mm. longis planis, antheris lanceolatis acuminatis, tuberculis 2 basalibus ad angulos. *Stylus* cylindricus, gracilis, stigmate capitato.

SUMATRA. Gunong Tandikat, 5,000 ft. alt., *C. G. Matthew.*

This is one of the few Medinillas with long pendulous sprays of white flowers, allied to *M. penduliflora* Ridley, of the Malay Peninsula. It differs in the larger number of nerves in the leaf, and conspicuous transverse nervules, the scurfy inflorescence and rounder petals. In one specimen there are two whorls of flowers in the spray as in *M. penduliflora.*

Memecylon cephalanthum *Ridley,* sp. nov., a *M. glomerato* Bl., cui affinis, foliis ellipticis majoribus siccis olivaceis, capitulis majoribus, petalis triangularibus acutis latioribus differt.

Frutex, ramis teretibus 4 mm. crassis. *Folia* rigide coriacea, elliptica, obtusa, basibus cuneatis, costa supra depressa subtus elevata, nervis obscuris, 5·5–8 cm. longa, 2·5–3·5 cm. lata ; petioli 5 mm. lati. *Flores* in capitulis densis oppositis 2 cm. latis dispositi, pedicellis 2–3 cm. longis. *Calyx* campanulatus, 2 mm. longus, limbo obscure lobato 2 mm. lato. *Petala* 4, triangularia, subacuta, 2 mm. longa. *Stamina* breviora, antheris brevibus curvis obtusis. *Stylus* filiformis. 4 mm. longus. *Drupa* ovoideo-globosa, 4 mm. longa.

BRIT. N. BORNEO. Labuan, *Motley* 207.

This species is certainly near *M. glomeratum* Bl., which occurs also in Borneo at Kuching (*Bartlett ; Haviland & Hose* 3679 : " flowers dirty white ") and was also collected in Sumatra at Indragiri, Sungei Latok, by *Curtis* (No. 3555), and I doubt very much if Miquel is not correct in referring to this species Hooker and Arnott's Canton plant *M. nigrescens,* which seems to me merely a poor form of it.

In *M. cephalanthum* Ridley, the leaves are broader, elliptic, blunt, and do not dry black as in *M. glomeratum* Bl. The heads of flowers are much larger and the petals are broader and not long-beaked.

Memecylon Havilandii *Ridley*, sp. nov., a *M. costato* Miq., cui affinis, nervis inconspicuis pluribus, intramarginali margini approximato, floribus in axillis capitatis differt.

Frutex ?, ramis superne quadrangulatis. *Folia* coriacea, laevia, elliptica, obtuse acuminata, basibus rotundatis, subsessilia, 10–22 cm. longa, 4·5–9 cm. lata, nervis inconspicuis circiter 22-jugis, intramarginali margini approximato ; petiolus 2 mm. longus vel subnullus. *Flores* pauci, in capitulis axillaribus brevibus. *Bracteae* binae, lanceolatae, acuminatae, persistentes, 1 mm. longae. *Pedicelli* graciles, 7 mm. longi. *Calyx* campanulatus, basi globosus, limbo latiore integro 2 mm. longo. *Petala* brevia, oblongo-rotundata, 3 mm. longa. *Stamina* breviora, filamentis brevissimis, antheris rectis conicis. *Stylus* vix longior.

SARAWAK. Kuching, *Haviland* 1630.

Allied to *M. costatum* Miq., but the faintly visible nerves are much more numerous, the intramarginal nerve quite close to the leaf-edge and the flowers clustered in the axils.

Memecylon scolopacinum *Ridley*, sp. nov., a *M. subtrinervio* Miq., cui affinis, foliis multo minoribus longe cuspidatis, alabastris obtusis, floribus paucioribus in pedunculo brevissimo differt.

Frutex vel *arbor parva*, ramis apice quadrangulatis pallidis. *Folia* coriacea, laevia, sicca virescentia, lanceolata, longe obtuse cuspidata (cuspide lineari obtusa 2 cm. longa), basibus breviter cuneatis, 5–5·5 cm. longa, 1·5 cm. lata, nervis obscuris ; petioli 2 mm. longi. *Flores* pauci, in pedunculo crassiusculo 1–2 mm. longo congesti, alabastra obtusa. *Bracteae* lanceolatae, 2 mm. longae vel minores. *Calyx* campanulatus, margine integro, 3 mm. longus. *Petala* 4, rotundata, 4 mm. longa, 3 mm. lata. *Stamina* 8, filamentis acuminatis, antheris curvis lanceolatis ferme 2 mm. longis, glandula dorsali lineari-oblonga. *Stylus* brevis, staminibus aequilongus. *Drupa* obconica, superne 8-costata, 3 mm. lata.

SARAWAK. Limbang, *Haviland* 543, 2208 (type) ; Benkaran, *C. J. Brooks* 300 (ex Herb. Hewitt).

Allied to *M. subtrinervium* Miq., which, however, has the nerves distinct whereas in *M. scolopacinum* Ridley they are quite invisible, and the leaves are much larger ; the buds too are acute, and the flowers more numerous on a distinct peduncle.

ARALIACEAE

Arthrophyllum ovalifolium *Miq.*

SARAWAK. *Beccari* 934.

This seems to be rare outside the Malay Peninsula.

Arthrophyllum rufo-sepalum *Ridley*, sp. nov., ab *A. diversifolio* Bl., cui affinis, foliolis oblongis acuminatis, panicula rufo-furfuracea, calycis lobis apice rufo-furfuraceis differt.

Arbor, umbellis exceptis glabra. *Folia* 30 cm. longa ; foliola 7, subcoriacea, opposita, oblonga, cuspidata, basibus subacutis inaequilateralibus, 15 cm. longa, 5 cm. lata, nervis supra depressis subtus elevatis 6-paribus, nervulis paucis inconspicuis ; petioluli 8 mm. longi. *Paniculae* ultra 12 cm. longae, ramis umbellae 4 cm. longis rufo-furfuraceis. Flores in umbella circiter 25, pedicellis 5 mm. longis. *Calyx* urceolatus, subangulatus, 2 mm. longus, lobis 4 ovatis apicibus rufo-furfuraceis. *Petala* 4, ovata, subacuta, 2 mm. longa. *Stamina* 4, antheris parvis subgloboso-oblongis, filamentis brevibus. *Stylus* minutus.

SARAWAK. Selabat, *Haviland* " l.m.m.f."

Arthrophyllum rubiginosum *Ridley*, sp. nov., ab *A. elliptico* Bl., cui affinis, foliolis crassioribus minoribus, calycibus pedicellisque rufo-furfuraceis, petalis cuneatis acuminatis differt.

Arbor, floribus exceptis glabra. *Folia* trifoliolata, supremis unifoliolatis ; foliola subcoriacea, supra glabra, subtus praesertim in costa parce furfuracea, ovata, breviter acuminata, obtusa, basibus rotundatis, 4–12 cm. longa, 2–5 cm. lata, nervis 5-paribus subtus elevatis inter se intra margines arcuantibus ; petioli 1·2–2 cm. longi, longitudinaliter rugosi. *Umbellae* furfuraceae, pedunculis 7–10 cm. longis. *Flores* ad 30 in umbella congesti, pedicellis atro-rufo-furfuraceis 5 mm. longis. *Calyx* obconicus, atro-rufo-furfuraceus, 3 mm. longus, limbo undulato, dentibus 5. *Petala* 5, cuneata, acuta, 4 mm. longa. *Stamina* 5, filamentis crassiusculis apicibus decurvis, antheris majusculis oblongis curvis apiculatis. *Discus* crassus, pulvinatus. *Stylus* crassus, conicus, obtusus, brevis.

SARAWAK. Baram, Miri river, *Hose* 566, 591 (type), 668.

This is allied to *A. ellipticum* Bl. (*A. Blumeanum* Zoll. et Mor.), but the leaflets are stiffer and smaller and when dry rugose. The calyx and pedicels are covered with a dark red scurf a little of which may often be seen on the backs of the leaves. The petals are lanceolate cuneate and subacute. This, like *A. ellipticum* Bl. and several other species, has been referred to *A. diversifolium* Bl., a species confined to Java and apparently scarce there, and very distinct. I have not seen the larger lower leaves of this plant, but they are probably bipinnate.

Schefflera aruensis *Ridley*, sp. nov., a *S. borneënsi* Merrill, cui affinis, foliolis tenuioribus oblanceolatis basibus attenuatis, calyce obconico differt.

Frutex. *Foliola* subcoriacea, glabra, oblongo-oblanceolata, breviter obtuse acuminata, basibus sensim attenuatis obtusis, 26 cm. longa, 11 cm. lata, costa subtus incrassata elevata, nervis tenuibus 6-paribus, secundariis gracillimis circiter 12-paribus, reticulationibus laxis irregularibus ; petioluli angulati, 9 mm. longi vel longiores. *Paniculae* glabrae, scabridae, 38 cm. longae. *Umbellae* dissitae, pedunculis 1 cm. longis, pedicellis 5 mm. longis. *Flores* in umbella 7–10. *Petala* et *stamina* non visa. *Discus* pulvinatus, cerebriformi-rugosus. *Stylus* brevis, crassus, conico-cylindricus.

ARU ISLANDS. Sine loc. exact., *Riedel*.

Schefflera lasiocalyx *Ridley*, sp. nov., a *S. subulata* Viguier, cui affinis, floribus sessilibus, calyce pilis dense tecto, petalis oblongis truncatis differt.

Frutex, caule vaginis ovatis coriaceis pallidis 1–2 cm. longis 5 mm.–1 cm. latis instructo. *Folia* 5-foliolata ; petioli 9 cm. longi ; foliola elliptica, longe acuminata, basibus attenuatis, coriacea, 9–14 cm. longa, 5–5·5 cm. lata, nervis tenuibus 6-paribus, reticulationibus laxis cònspicuis ; petioluli 1·5–3·5 cm. longi. *Paniculae* graciles, superne pilis stellatis mollissimis tectae, 30 cm. longae. *Flores* circiter 11, in capitulis sessiles, pedunculis 5 mm.–1 cm. longis. *Calyx* campanulatus, pilis stellatis albescentibus dense tectus, 2 mm. longus. *Petala* 4, oblonga, truncata, 2 mm. longa. *Stamina* 4, filamentis longis filiformibus, antheris oblongis. *Discus* albescens, rugosus. *Stylus* brevis, crassus, conicus.

SARAWAK. Near Kuching, *Haviland & Hose* 3212.

This is very near to *S. subulata* Viguier, but the flowers are quite sessile, the calyx covered with a dense thick white woolly mat of stellate hairs, and the petals are oblong and truncate.

Schefflera laxiflora *Ridley*, sp. nov., a *S. corona-sylvae* Viguier, cui affinis, differt foliolis multo majoribus coriaceis, paniculis laxis ramosis, floribus minutis.

Frutex glaber, ramis pallidis, stipulis persistentibus lanceolatis acuminatis coriaceis 1·5 cm. longis. *Folia* 3–4-foliolata ; petioli validi, 15 cm. longi ; foliola coriacea, elliptica, longe acute acuminata, basibus cuneatis, 20–30 cm. longa, 8·5–14 cm. lata, costa subtus elevata crassa, nervis gracilibus 6-paribus inter se arcuato-anastomosantibus, reticulationibus latis conspicuis. *Paniculae* terminales, basi ramosae, 15 cm. longae, ramis gracillimis 10–14 cm. longis patentibus pubescentibus. *Umbellae* circiter 10-florae, pubescenti-furfuraceae, pedunculis 1·2 cm. longis, pedicellis purpureo-brunneis 4 mm. longis. *Flores* perparvi, albi. *Calyx* campanulatus, 1 mm. longus. *Petala* oblongo-ovata, 1 mm. longa. *Stamina* 4 vel 6, alba, filamentis gracillimis filiformibus 5 mm. longis, antheris parvis ellipticis. *Ovarium* triloculare.

SARAWAK. Bidi, limestone, "colour white, stalks purple brown," *C. J. Brooks* 1 (type) ; Mt. Koum, limestone, *Haviland* 1713 ; near Kuching, *Haviland* 2949 : "Pedicels etc. brown. Stamens white, 4 to 6. Petals valvate (?) caducous. Ovary 3-celled."

Schefflera corona-sylvae *Viguier.*

SARAWAK. Rejang, Sibu, *Haviland* 1877.

The specimen exactly resembles the Javanese species.

Schefflera rubiginosa *Ridley*, sp. nov., a *S. borneënsi* Merrill, cui affinis, foliis majoribus pilis stellatis rufo-pilosis, basibus rotundatis, floribus rufo-pubescentibus differt.

Frutex epiphyticus. *Folia* 5-foliolata ; petioli 60 cm. longi ; foliola coriacea, subtus dense rufo-ferruginea, pilis stellatis tecta, elliptica, acuminata, basibus rotundatis, nervis elevatis 9-paribus, costa crassa, reticulationibus laxis, 20–24 cm. longa, 10 cm. lata ; petioluli 6 cm. longi. *Stipulae* lanceolatae, coriaceae, 2·5 cm. longae. *Paniculae* 50 cm. longae, ferrugineae. *Umbellae* 13–14-florae, pedunculis 2–2·5 cm. longis, pedicellis 5 mm. longis. *Calyx* campanulatus, 1 mm. longus, pilis stellatis tectus, margine integro. *Petala* 4 vel 5, ovata, obtusa, ferruginea, 2 mm. longa. *Stamina* 5, brevia, filamentis brevibus crassiusculis, antheris ellipticis. *Discus* griseus, multirugosus.

SARAWAK. *Beccari* 888, 1231 (type) ; Mt. Matang, epiphyte, *Haviland* 831 ; Kuching, *Haviland & Hose* 3393.

This is allied to *S. borneënsis* Merrill but has much larger leaves covered with rufous stellate hairs beneath.

Schefflera grisea *Ridley*, sp. nov., a *S. rubiginosa* Ridley, cui affinis, foliolis subtus glabris griseis, nervis pluribus differt.

Arbor 3–5 metras alta. *Folia* 4- (vel pluri-) foliolata ; petioli crassi, teretes, 60 cm. longi ; foliola coriacea, subtus grisea, minute rugosa, elliptico-oblonga, basibus rotundatis, 27 cm. longa, 9·5 cm. lata, costa subtus elevata, nervis 13-paribus gracilibus subtus elevatis, secundariis paucis, reticulationibus laxis ; petioluli 9 cm. longi. *Paniculae* racemiformes, dense hirtae, setis flavescentibus basi longioribus obsitae, 50–93 cm. longae, validae, pedunculis 2–2·5 cm. longis (sub fructu 4 cm. longis) hirtis, pedicellis 5 mm. longis pilis stellatis minutis tectis. *Flores* in umbella circiter 20. *Bracteae* lanceolatae, hirtae, 1 cm. longae. *Calyx* campanulatus, margine integro, 2 mm. longus. *Petala* 5, triangularia, obtusa, puberula, 1 mm. longa. *Stamina* 5, brevia, antheris oblongo-ellipticis. *Discus* conicus, valide costatus. *Stylus* nullus.

SUMATRA. *Beccari* 535 (type) ; Sibolangit, Bukit Kluang, near Medan, *Mhd. Nur* 7433 : " Tree 10 to 15 feet tall."

I have not seen a complete leaf of this plant, but as a section, apparently half, bears four of the leaflets, it probably has at least eight.

THYMELAEACEAE

Gonystylus augescens *Ridley*, sp. nov., affinis *G. borneënsi* Gilg, a quo foliis multo majoribus et crassioribus, ramis paniculae dense sericeo-hirtae accrescentibus, sepalis ovatis nec lanceolatis distat.

Arbor parva. *Folia* ovata vel oblonga, breviter obtuse cuspidata, basi rotundata, 15–22 cm. longa, 10–13 cm. lata, crasse coriacea, glabra, costa superne depressa subtus elevata ; nervi 12-jugi, utrinque elevati, intra margines inarcuantes, secundarii plures, fere aequaliter conspicui, cum primariis anastomosantes ; petioli 1 cm. longi, crassi, transverse rugosi. *Panicula* terminalis, crassa, sericeo-hirta, 2–3-ramosa, 4–15 cm. longa ; bracteae oblongae, obtusae, 5 mm. longae, caducae ; pedicelli 1 cm. longi, crassi, sericei. *Flores* plures, seriatim expansi. *Sepala* 5, ovata, 5 mm. longa, sericeo-tomentosa. *Petala* 16, breviora, lanceolato-linearia, hirta, acuminata. *Stamina* 16, brevia ; antherae oblongae. *Ovarium* ovoideum, hirtum, triloculare ; stylus sinuatus, hirtus, stigmate rotundato. *Capsula* lanceolata, 4·5 cm. longa, 1·4 cm. crassa, lignosa. *Semina* lanceolata, acuta, solitaria.

SARAWAK. Kuching, *Haviland* 488, 2078.

This species is very distinct in the inflorescence, which consists of a panicle of two or three rather thick branches which elongate as the flowers open and fall leaving an alveolus surrounded by thick silky hairs. The bracts, which are large for the genus, fall before the flowers open. As the raceme-like branches elongate, the internodes between the flowers lengthen to 8 mm. and become nearly glabrous. The fruit, of a lanceolate outline, with a lanceolate seed, may be not quite ripe, but it is very distinct in form from any other species of which the fruit is known.

G. Maingayi *Hook. fil.*

SARAWAK. Near Kuching, *Haviland* 3660.

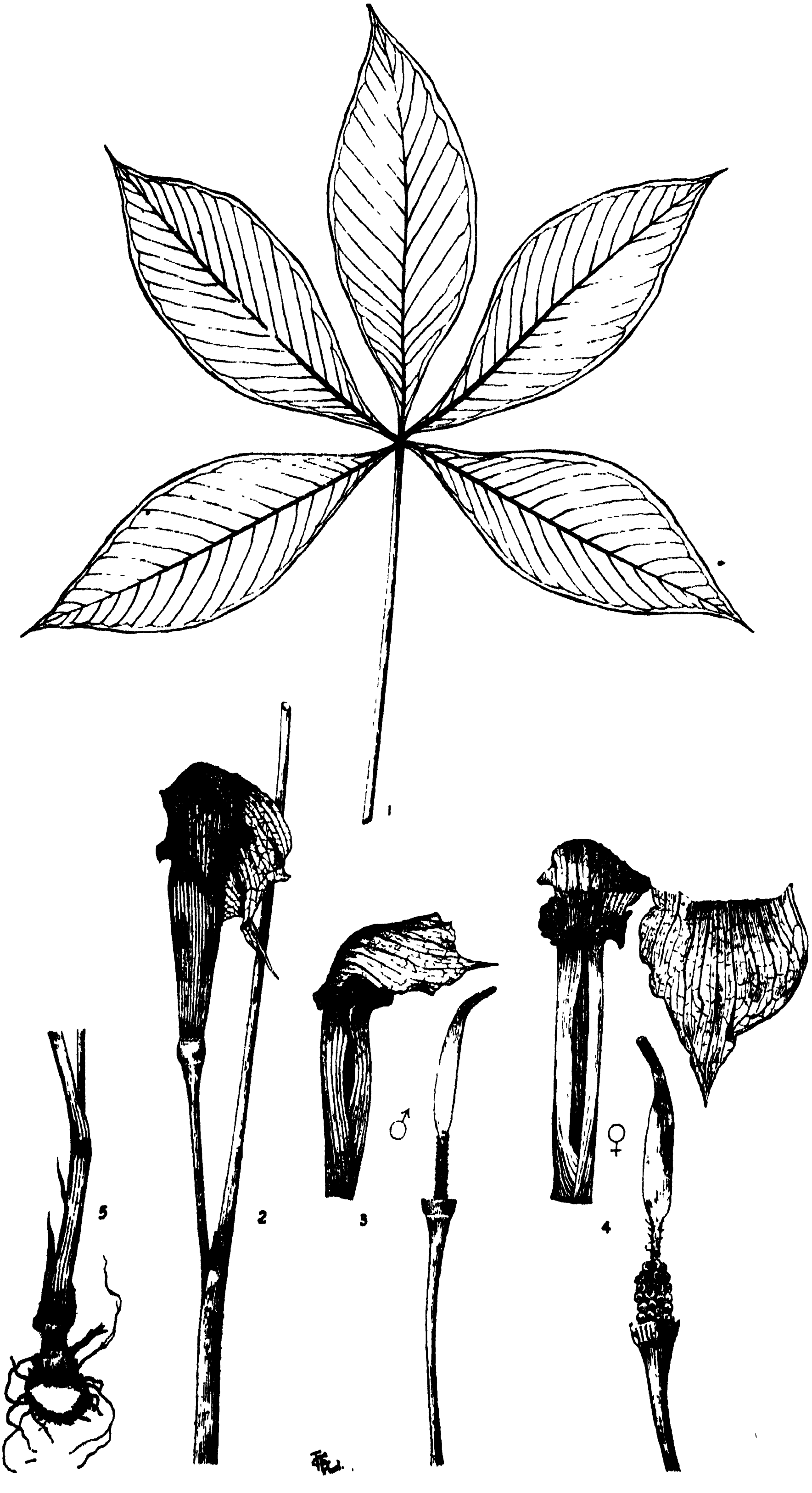
I cannot separate these specimens from the Malay Peninsula plant.

A NEW SPECIES OF ARISAEMA.

The late Prof. E. Barnes.

Arisaema auriculata *E. Barnes*, sp. nov., affinis *A. Barnesii* C. E. C. Fischer, sed foliorum segmentis majoribus sessilibus cuspidatis vel breviter acuminatis, spathae limbo basi auriculiformi, inter alia differt.

A rather large tuberous *herb*. *Corm* about 2·5 cm. diam., flesh pale green, outer surface dark and wrinkled. *Roots* fibrous, emerging from the upper part of the corm, pale pink. *Cataphylls* 2, clasping the base of the petiole, reddish-brown mottled, tips rounded, the longer about 20 cm., the shorter about half as long. *Leaf* solitary ; petiole up to 56·5 cm. long, cylindric, rather thick and fleshy, smooth, brownish-pink or flesh-coloured, mottled lighter, and with small scattered red spots, sometimes pale green, unmottled ; blade radiatisect, leaflets usually 5, occasionally 3, 4, 6 or 7, sessile, elliptic to elliptic-obovate, up to 28 cm. long and 10 cm. broad, rarely up to 35 by 16 cm., upper surface light green, about 15 pairs of nerves distinct but not strong, intramarginal nerve running round the upper half or two-thirds, sometimes continuing indistinctly to base, margin thickened and with a minute brownish frilled edge, under-surface pale glaucous, with a downy appearance and feel but not pubescent ; tip cuspidate or shortly acuminate. *Peduncle* solitary, emerging from the petiole about 1/3 of the way from the base of the latter, often curved round the petiole, slender, cylindric, almost white. Tube of *spathe* narrow, cylindric (very narrowly funnel-shaped in male inflorescences), 7·5 cm. long in front and 9·5 cm. at back to beginning of dome, up to 1·3 cm. in diameter, flesh-coloured with dull reddish longitudinal striations (under a lens these are seen to be bands of crimson spots), mouth revolute and forming a broad rim about 15 cm. wide, base of limb domed, upper part broader than long, 6 cm. across, sides rounded, terminal portion triangular with the two halves somewhat folded together so that the tip projects forward, light green flushed brownish-crimson, veins numerous and distinct. (Owing to the base of the limb being domed the upper part is brought forwards and downwards and is pressed against the front of the tube. The turned-out margins at the sides of the mouth, and the sides of the limb which curve over them, form a wide round opening at each side of the spathe. It is by these openings that insects enter the tube.) *Female flowers* crowded together on the lowest 2 cm. of the spadix ; ovaries globose, green, glossy ; stigmas tufted, almost sessile. *Spadix* narrow just above the female flowers and bearing a few filiform or flattened neuters ; then dilating to a broad, irregularly cylindric, pinkish portion, about 2·5 cm. long, of a soft cellular texture ; then tapering to a curved, forward-pointing, narrow end, 2·5 cm. long, with a rounded apex and corrugated surface. *Male flowers* consisting of groups of about 6 globose, liver-coloured, sessile anthers, no neuters in male inflorescences, appendage as in female but more slender. (As in other S. Indian species, there is a small aperture at the base of the tube in male spathes, but not in female. In some plants the right margin of the spathe overlaps the left, in others the left is over the right.) *Berries* (immature) about 4 mm. in diam., globose, mature not seen.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INDIA.—Growing in large clumps on high rocks on the Nilambur Ghat, Nilgiri Wynaad, 2,500—3,000 ft., fl. July, *E. Barnes.*

This species comes very near to *A. Barnesii* C. E. C. Fischer, from which it differs in being larger in all parts, leaf-segments sessile, cuspidate or shortly acuminate, intra-marginal vein extending to two-thirds from the apex, and the limb of the spathe being auriculate at the base. The large ear-like openings at the sides of the spathe, the broad deflexed limb and the light green leaves with the glaucous under-surface distinguish it from other S. Indian species. In one inflorescence the lower half of the fertile portion of the spadix bore female flowers and the upper portion male flowers. In another some of the neuters above the female flowers were replaced by stamens.

The illustrations accompanying this description were drawn by Mr. T. C. Paul.

1, leaf; 2, spathe, dorsal view, and base of petiole; 3, male inflorescence, spathe detached, in front view; 4, female inflorescence, ditto, with apex of spathe folded back showing inner surface; 5, base of plant with corm. All × ½.

NOTES ON SOME SPECIES OF THE GENUS CRYPTOLEPIS R. BR.: I.

E. A. BRUCE.

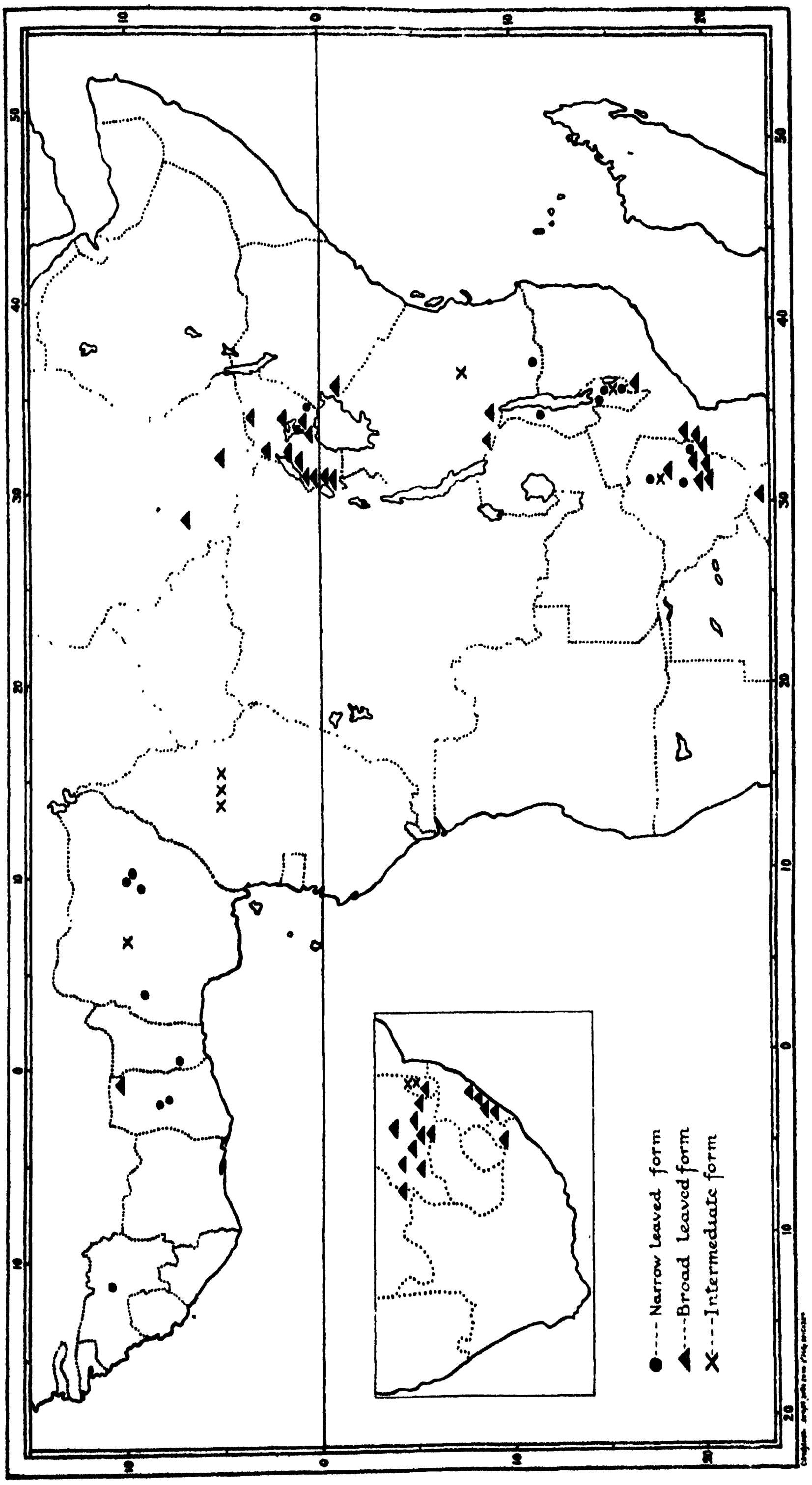
The object of these notes is to clarify the position of some closely allied species of the genus *Cryptolepis.*

There seem to be no clear and constant characters on which to differentiate the species *C. oblongifolia* (Meisn.) Schltr. and *C. nigritana* (Benth.) N.E. Br. In the Flora of Tropical Africa Dr. N. E. Brown, in his Key, distinguished them by the size and shape of the leaves:—

Leaves lanceolate to elliptic-oblong, 2—5 times as long as broad	*oblongifolia*
Leaves linear or linear-lanceolate, 4½—12 times as long as broad	*nigritana*

In the descriptions which follow, the only other differential character mentioned is the shape of the bracts, which are said to be ovate and obtuse in *oblongifolia* and ovate-lanceolate and acute in *nigritana.*

The types of both species (*Krauss* 322 and *Barter* 1324) were dissected to see if any other distinguishing characters were present, but nothing of value was observed. It is quite possible to separate the type specimens on the characters used by Dr. N. E. Brown, but when an attempt was made to sort the Kew material into the two species it was found that there were a large number of specimens which might equally well be placed in either group. The specimens were then re-examined with reference to the floral structure, type of inflorescence and size of fruit. There was



Map showing known distribution of *Cryptolepis oblongifolia* (Meisn.) Schltr.

variation in all these characters, but nothing constant which could be used as a specific character. The sinus-pocket varied from emarginate to truncate and toothed ; the flower-bud though generally acute was sometimes subacute or obtuse ; the inflorescence was lax or dense, subsessile or pedunculate ; the fruits on one specimen varied from 7 to 12 cm. in length, whilst the leaves on another specimen from Pretoria varied from one-and-a-half to five times their breadth. It was interesting to note that frequently the fruiting branches had broad elliptic leaves, whilst on the flowering ones the leaves were narrowly lanceolate. Thus, though there was variation, there were no consistent features which could be grouped together and used to separate the plants specifically.

The distribution of the species was then plotted on a map, and though the majority of the West African specimens fell into the narrow-leaved group and the South African were of the broad-leaved form, there were exceptions. There were also intermediate forms in the Cameroons, Tanganyika, S. Rhodesia and the Transvaal, and both types occurred in East and South Tropical Africa.

The possibility of hybridization was considered, but there seemed to be no clear-cut grouping of characters which would uphold this supposition. Indeed, the variation on single specimens was sometimes sufficiently striking to give the appearance of a "mixture." In view of these facts and after careful consideration and study of the collectors' field notes, the writer is of the opinion that only one plastic, widespread, variable species exists—**C. oblongifolia** (*Meisn.*) *Schltr.*

The synonymy is therefore as follows :—

Cryptolepis oblongifolia (*Meisn.*)*Schltr.* in Journ. Bot. **34,** 315 (1896). *Ectadium ? oblongifolium* Meisn. in Hook. Lond. Journ. Bot. **2,** 542 (1843). *Secamone acutifolia* Sond. in Linnaea **23,** 76 (1850). *Ectadiopsis oblongifolia* (Meisn.) Benth. in Benth. et Hook. f. Gen. Pl. **2,** 741 (1876). *E. acutifolia* (Sond.) Benth. l.c. *E. nigritana* Benth. in Hook. Ic. Pl. **12,** 75, t. 1187 (1876). *E. Welwitschii* Britt. in Trans. Linn. Soc. Bot. Ser. 2, **4,** 26 (1894), non Baill. *E. nigritana* Benth. var. *congesta* K. Schum. in Engl. Jahrb. **23,** 232 (1896). *Cryptolepis Elliotii* Schltr. in Journ. Bot. **33,** 300 (1895). *C. nigritana* (Benth.) N.E. Br. in Dyer, Fl. Trop. Afr. **4** (1), 251 (1902).

ROYAL GARDENS

KEW.

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1933	15	0	15	7	16	0
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Kew Bulletin

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No. 2, 1946

SMALL INITIAL LETTERS FOR ALL SPECIFIC EPITHETS

Beginning with the first part of the 1947 volume, all specific epithets will be printed with a small initial letter in the Kew Bulletin. This decision has been reached in order to ensure uniformity, and to avoid the unwarrantable expenditure of time on research when the use of capitals is in doubt. The arguments in favour of following the modified recommendation passed at the Amsterdam Congress, 1935, have not been ignored in reaching this decision, but they appear to be very definitely outweighed by practical considerations.

The existing practice will, however, be continued in the Index Kewensis until the wishes of other nationalities on this matter have been ascertained.

NEW RECORDS OF PLANTS FROM INDIA AND BURMA

D. CHATTERJEE.

Fortuynia Aucheri *Shuttl. ex Boiss.* (*Cruciferae*).

BELUCHISTAN. Kacha Thana, altitude 1,700 m., 31 May 1912, *L. A. Watson* 65, 66 ; ibid., 12 June 1916, *L. A. Watson* 82.

Previously known from South Persia.

Trachelospermum auritum *C. K. Schneid.* (*Apocynaceae*).

ASSAM. Khasi Hills, without precise locality, *Kurz* 167 ; below Cherra, *Hooker* s.n. ; Chure (probably Cherra ?), *Hooker* 837. Manipur : Maopong, 27 May 1882, *G. Watt* 7,177 ; Kangpokpi, 20 June 1935, *N. L. Bor* 6,373, N.E. Frontier : Kobo, 13 December 1913, *U. N. Kanjilal* 3,166 (in fruit).

Previously known from S.W. China : Yunnan (*Henry* 12,136).

This species and *T. Curtisii* King et Gamble together form a group very distinct from the rest of the species of the genus *Trachelospermum.* I agree with Schneider (in Sargent Pl. Wils, **3**, 341 : 1916) in this respect, but refrain from raising his subgenus *Lachnocarpus* (l.c.) to generic rank until I have studied this and some allied genera, although I feel that these two plants should be separated from *Trachelospermum* on grounds of general facies and the peculiar 5-partite disk almost enclosing the ovary.

A

Petrocosmea *Oliver* (*Gesneriaceae*).

This genus with about 15 species was previously known from China and Siam. Fischer (Kew Bull. 1926, 428) says that *P. Parryorum* from the Lushai Hills, Assam, is the first record of the genus from India. This is true so long as we do not know the real identity of another plant, *Trisepalum Kingii* C. B. Clarke. This plant on examination proves to be a *Petrocosmea*. There is also record of another species from Burma. So we have three species as follows :—

Petrocosmea Kingii (*C. B. Clarke*) *Chatterjee*, comb. nov.

Trisepalum Kingii C. B. Clarke in DC. Mon. Phanerog. **5,** 139 (1883).

Add description of fruit :—narrowly ovoid on long stalk, very thinly hairy, 8 mm. long, 2 mm. wide.

BURMA. Tenasserim, Amherst Distr., Moolyet Hill, 1800 m., 1877 (fld. R.B.G. Calcutta, April 1877, 1879 and 1880), *Gallatly* s.n. ; Muleyit, January 1912, *Lace* 6,283.

Petrocosmea Wardii *W. W. Smith* in Notes R. Bot. Gard. Edinb. **13,** 175 (1921).

BURMA. Bhamo, *S. M. Toppin* 2,695.

Previously known from Yunnan, S.W. China : Nam Ting, *Kingdon Ward* 3,772, and Shweli-Salwin divide, *Forrest* 24,376.

Petrocosmea Parryorum *C. E. C. Fischer* (l.c.).

ASSAM. Lushai Hills, localities as cited by Fischer. New records : Naga Hills ; Paona, 2,000 m., in shade of rock in wet places, 7 Sept. 1935, *N. L. Bor* 6,260 ; Mesolazumi, 2,000 m., on a vertical bank in deep shade, 20 July 1935, *N. L. Bor* 6,315.

Elsholtzia communis (*Coll. et Hemsl.*) *Diels* (*Labiatae*).

ASSAM. Lushai Hills : Tawipeni, *Mrs. N. E. Parry* 462.

Previously known from Upper Burma ; China ; Siam ; *vide* Rec. Bot. Survey India **14,** no. 1, 90 (1940).

Teucrium plectranthoides *Gamble* in Kew Bull. 1924, 266, et Fl. Madras **1,** 158 ; Mukerjee in Rec. Bot. Surv. Ind. **14,** no. 1, 222 (1940).

The type sheet of this species in Herb. Madras 13,603 was collected on 25th September 1916. I have recently examined very good material of this from an earlier collection sent to Kew for determination from Calcutta. This was collected from the same locality as the type collection by *Hooper & Ramaswami* 38,609, dated 14th February 1913. The lamina and petiole of the leaves of this collection vary considerably, although in my opinion this is the same plant. Mukerjee's description in his revision of the *Labiatae* of India should therefore be modified as follows :—

Lamina : 6–10 cm. long ; 4–8 cm. wide ; Petiole : 1–5 cm. long.

S. INDIA. Tinnevelly District : Neterikal to Sengalteri, *Hooper & Ramaswami* 38,609.

Hydrobryum Griffithii (*Wall.*) *Tul.* (*Podostemaceae*).

N.E. ASSAM. Ledo, Tirap river, on mile 3 mark on Stilwell Road, *D. C. Mukherjee*.

Previously known from Khasi Hills.

FENCE AND BARRIER PLANTS IN WARM CLIMATES.

F. N. Howes.

A large number of plants, probably more than 500 species, are used for hedges or fences in the warmer parts of the world. Some of these are now widely distributed in cultivation and are to be found, sometimes naturalised, wherever conditions are suited to them, whereas others appear to be more or less peculiar to certain countries and have not yet become widely adopted as hedge or fence plants.

Hedges may be grown for a variety of purposes, either for purely ornamental effect, as screens for privacy or to hide unsightly objects or buildings, to indicate boundaries, as shelter for livestock or as barriers to exclude trespassers and wild or domesticated animals from fields and crops. When grown for the latter purpose the plants selected are usually of a spiny or thorny nature.

In many parts of the tropics and sub-tropics where agriculture is mainly in the hands of peasant cultivators who cannot afford barbed wire fences, barrier or fence plants play an important part and may be regarded therefore as a not unimportant group of economic plants. Apart from the cost of barbed wire (now considerably enhanced) to peasant cultivators, wooden fence posts in the tropics speedily rot and require frequent replacing. The custom in many areas is for natives to surround their cultivated plots with barricades made of cut branches of thorny trees and shrubs such as those of *Acacia* and *Zizyphus*. Although efficient in excluding animals while they last, their effective life is not long, when the labour of remaking the whole barricade must be repeated.

If a suitable live fence be planted next the barricade when it is erected, by the time the barricade commences to decay the live barrier will have developed sufficiently to take its place. Where ' shifting cultivation ' is practised by the native population, a common custom in many parts of the tropics, there is no need for a fence or barrier lasting more than a year or two, and the short-lived barricade of dry branches suffices. The practice of ' shifting cultivation ' is now universally deprecated and discouraged on account of the waste of valuable forest and excessive soil erosion to which it leads. The remedy is the more permanent cultivation of fields or plots along with modified cultural practice involving rotation crops, green manuring, etc. This calls for a more permanent type of fencing and points the way to extended use of the live fence, which can be so effective and yet so cheap, provided of course the right type of plant is chosen and the necessary care in planting and in the early stages of its development is given.

Work on soil erosion and soil erosion control which has been carried out in recent years and which has been almost world-wide in its scope, has brought to light the value of some hedges and hedge plants under certain conditions, for erosion due both to rain and running water and to wind, particularly in light sandy soils where arable farming is extensively practised as in wheat-growing areas of Australia. The selection of suitable hedge plants for this type of work under the varied climatic conditions where soil erosion is serious is yet in the early stages.

There are many qualities that are desirable in plants used for hedging purposes. They should be of dense, bushy, even growth, and preferably armed if required for fences. They should not be of very slow growth or, on the other hand, too rank in growth and require much attention to be kept within bounds. Evergreen hedges are usually preferred to those that are deciduous. A high degree of resistance to drought or cold is necessary in some areas, while ease of propagation and adaptability to various situations are other desirable features. Long life, a tendency to make new growth near the ground, but not to sucker freely, ability to stand frequent clipping or cutting and resistance to disease and insect pests are also important. Ability to withstand termites is an important consideration in some areas, particularly throughout tropical and sub-tropical Africa. Most of the hedge plants grown in hot countries, even among those in common use, do not possess all these qualifications. Nevertheless, they form useful hedges, the suitability of each depending upon the purpose for which it is required, or the locality or type of soil where it is grown. Some of the small bamboos, otherwise very desirable hedge plants, are unpopular on account of their free suckering habit. Another hedge plant difficult to keep within bounds, but nevertheless often grown, is the Australian kangaroo thorn (*Acacia armata* R. Br.).

Although ease of propagation is desirable in any hedge-plant in view of the number of plants that must of necessity be used in establishing a hedge, a hedge-plant should not have the power of spreading spontaneously very freely and thus becoming a nuisance in the locality. This has taken place with a number of plants originally established as hedges, usually through the scattering of the seeds by birds. In parts of Australia and New Zealand examples of this are to be found in the African box (*Lycium afrum* L.), European barberry (*Berberis vulgaris* L.), gorse (*Ulex europaeus* L.), and even hawthorn (*Crataegus Oxyacanthoides* Thuill. : *C. monogyna* Jacq.). In more tropical areas *Opuntia Dillenii* Haw. and *Lantana camara* L. are among fence plants that have become pests through invading nearby areas.

Opinions differ regarding the relative value of single or double planting with hedges, though it is usually agreed that for most purposes single planting is preferable. It allows each plant free development on two sides and fewer plants are required in planting. Where hedges are intended to resist cattle, however, double planting, with the increased width and resistance that it gives, is generally desirable. For hedges 3–4 feet in height a 6–12 inch spacing is usually given, and for those 6 feet high not less than 1½ feet.

The shape of a trained hedge grown for ornamental purposes is largely a question of personal taste, many favouring the rectangular form or the rounded top which is perhaps the more artistic. Although not often seen, the ideal shape for a hedge is tapering or wedge shaped (widest at the bottom), for this allows more light to reach the basal branches and encourages the hedge to be vigorous and bushy near ground level. This is important in the case of hedges for excluding animals, as their value depends on the density of the base rather than the height or thickness of the top. A hedge which is thin or badly formed at the bottom soon weakens whereas one with well-developed branches low down will retain its vigour. A strong and well-developed base is often largely a question of proper pruning or cutting back in the early stages of growth. However, no hard and fast rules can be laid down for the multiplicity of plants used for hedges and fences in warm countries, as these differ so in their requirements, some like *Agave* and certain Euphorbias requiring no pruning whatsoever.

The possession of spines or thorns obviously increases the effectiveness of any fence or barrier plant. Furthermore it assists in protecting the plant from the depredations of grazing animals, particularly in the early stages. Even so, most hedge plants, whether armed or not, require protection in the early stages, for there are few plants that goats and sheep will not eat or nibble when young and all are liable to be trampled by cattle. Temporary double wire fencing usually provides the best protection from livestock. Among the hedge-plants that some observers have recorded as immune from goats, even when young, are *Adhatoda Vasica* Nees, *Pedilanthus tithymaloides* Poit., *Euphorbia Tirucalli* L. and other Euphorbias. The degree of spinosity of fence plants is sometimes affected by habitat and climatic conditions, being more pronounced in the drier areas. This is well illustrated in some of the Acacias used for hedges, the spines being more freely developed in dry than in wet or humid areas. This is also the case with *Commiphora Berryi* Engl., a useful spiny hedge in the dry tropics especially in parts of Africa, India and Ceylon. When grown in wet districts it loses much of its spininess and has an altered appearance.

Among the armed hedge-plants of the tropics and sub-tropics almost every type of " thorn " or pointed outgrowth is to be found, from the delicate epidermal prickles of some of the *Euphorbiaceae* and *Cactaceae* to the stout spines (modified branches) of *Gleditschia*, *Carissa*, *Flacourtia* and *Haematoxylon*, often branched and in some cases several inches in length. Armed leaves are well illustrated in *Furcraea*, *Jacquinia* and *Pandanus*, the latter with hooked prickles in both the forward and backward direction, while stipular spines occur in *Paliurus* and *Zizyphus*.

One of the subsidiary advantages of hedges, and one which is not always fully appreciated, is the fact that they provide cover and nesting places for many insect-eating birds. This is notably the case in extensive grain-growing areas, as in Australia and North America, where 'clean farming' is widely practised and little or no trace of the original scrubby vegetation remains. Here many of the native birds are unfitted to survive under the entirely new conditions and do not have time to adjust themselves to the changed environment, consequently they tend to become scarce or even extinct. Informal farm hedges or shrubby fence rows, particularly when of a thorny nature and allowed to develop fairly freely, afford ideal nesting places for insectivorous birds of various kinds, and in fact act as travel lanes for these insect pest destroyers. A hedge plant which has proved very desirable in this respect in South Australia and elsewhere in the sub-tropics is the so-called " Kaffir Plum " or " Kei Apple " (*Aberia caffra* Harv.). It may be regarded as the counterpart of the hawthorn in more temperate climates, but has the advantage of being evergreen.

In the United States increasing value is now attached to lanes or belts of wild or shrubby plants on farm lands, one writer stating " The farm that keeps all natural nooks and produces wild life food and cover as widely distributed and abundant as compatible with successful farming will come nearest to attaining the biologic balance that is so necessary to wild creatures and so beneficial in maintaining the farm." (Biologic Balance on the Farm. W. L. McAtee, Ann. Rept. Smithsonian Inst. 1939). Obviously no farm hedge should be allowed to run completely wild or spread unevenly into fields and injure crops. In the tropics where shrubby vegetation is more spontaneous and free-growing the same dearth of bird and wild-life cover is less likely to arise.

One of the main functions of farm hedges is the shelter they provide for livestock. Even in the sub-tropics there are areas subject to cold winds in the cold season, expecially on open plains and at the higher altitudes. The more a farm animal is exposed to such winds the more food is utilized in keeping its body warm and less goes to productive uses, young animals in particular being stunted or weakened by such exposure. In many parts of South Africa, and doubtless elsewhere, lack of shelter for livestock is very noticeable in some pastoral districts. Suitable hedge plants of the dense tall-growing type could be put to good account at small cost if a commencement were made by planting a short stretch of hedge along each of the two fences in the four corners of a paddock. By this means shelter would be provided in whichever direction the wind might be, and planting could be extended as required.

A number of woody species that are of scandent habit and not of the erect bushy growth usually associated with hedge plants are grown as barrier plants in warm climates, some sort of support being provided in the early stages such as a low wall or rough stake fence. In the early stages of development the trailing branches are tied back or interlaced with one another from time to time in the required position. As further growth takes place from these branches an impenetrable mass is formed and only occasional trimming may be required. The Bougainvilleas are among the better-known plants employed in this way, and may be made into very effective and at the same time ornamental live barriers. *Acacia pennata* Willd., which possesses the same type of growth but is even more efficiently armed, may also be used in this manner. In time it forms an impenetrable thicket. The " cockspur " or " fingrigo " (*Pisonia aculeata* L.), a straggling shrub widely distributed in the tropics, is another plant of this class. Its strong axillary recurved spines make it well suited for field enclosures and renders extrication of anyone caught in it very difficult. *Scutia myrtina* (Burm.) Kurz. (*Rhamnus circumscissa* L.) is another well-armed plant of trailing habit which has overrun some areas in India. The Macartney rose (*Rosa bracteata* Wendl.) with its large white flowers and evergreen glossy foliage is a useful barrier plant in many parts of the sub-tropics. It needs support when young but soon develops into a wide impenetrable hedge. Under favourable conditions in Southern Rhodesia it has been found to resist cattle in its second season, so vigorous is its growth.

A common method of rapidly establishing live barriers to exclude animals or human intruders in the tropics and sub-tropics is by the use of stakes or truncheons from plants known to strike readily by this means. These are usually planted in the wet season and closely spaced or arranged at an angle so that they cross one another in a latticed fashion. Such fences are often very popular among natives in Africa and India and have doubtless been employed by them as defensive measures round their habitations and as livestock enclosures from very early times.

Plants with well-developed thorns are often, though not always, selected for this purpose. Half a dozen or more species of *Erythrina* are used in this way, all more or less thorny and often rooting with extraordinary facility, even from large branches. Other armed plants so used are *Commiphora Berryi* Engl. (in common use throughout the dry tropics of India and Africa), *Commiphora africana* Engl. (West Africa), *Delonix elata* Gamble (well suited to very dry areas) and several species of *Pandanus*, the best known being probably *P. tectorius* Sol. This species exists in many varieties and is frequently used in the East as a fence round paddy fields, although it is sometimes accused of harbouring rats unduly. Certain spiny succulent plants are also used, especially some of the cactiform Euphorbias. Among the unarmed species used as fences and grown from stakes or large branches are the "physic nut" (*Jatropha Curcas* L., universal throughout the tropics), *Euphorbia Tirucalli* L. (also widely used), several species of *Ficus* and *Spondias*, *Sterculia tragacantha* Lindl. in West Africa, and *Pedilanthus tithymaloides* Poit., often to be seen around fields in Ceylon.

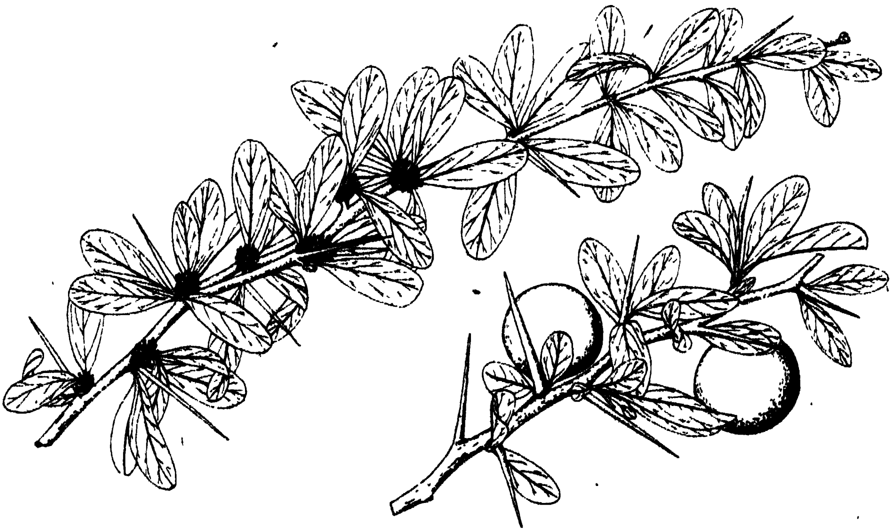
Live stakes are sometimes employed in a different manner. Planted vertically about a yard apart they are allowed to develop naturally, and cut branches, mats, corn stalks, wire or even wire netting may be attached to them to form an animal-proof enclosure. Their main function is to serve as living fence posts rather than to constitute the fence themselves. In northern Nigeria and other parts of West Africa this method of fencing is very common. A good account of it and the species employed in northern Nigeria has been given by Bond (1944). Two of the most commonly used plants for live stakes in that area appear to be *Newbouldia laevis* Seem. and *Commiphora Kerstingii* Engl. Others are *Boswellia Dalzielii* Hutch., *Moringa oleifera* Lam., *Ficus Thonningii* Blume, *Azadirachta indica* A. Juss., *Dalbergia Sissoo* Roxb., and *Cassia siamea* Lam.

Some of the species used as hedge or barrier plants in warm countries have other economic uses. A number yield edible fruits or fruits well suited for jams and preserves. Usually, however, these fruits are only produced when the hedges are grown informally or receive but little pruning and so flower freely. The Natal plum or "Amatingula" (*Carissa grandiflora* A.DC.), now fairly well known throughout the sub-tropics as a hedge plant, yields a fine dark-red fruit about the size of a pullet's egg, appreciated by most palates, either in the raw state or as a preserve. A few other species of *Carissa* are grown as hedge plants and have edible fruits, though these are smaller than the Natal plum. The Governor plum (*Flacourtia indica* Merr.), Barbados cherry (*Malpighia glabra* L.), Surinam cherry (*Eugenia uniflora* L.), Otaheite apple (*Spondias cytherea* Sonner), Lime (*Citrus aurantiifolia* Sw.) and the Myrtle lime (*Triphasia trifolia* P. Wils.), are well-known hedge plants in the tropics with useful fruits. Others employed in the dry tropics and sub-tropics include the pomegranate (*Punica granatum* L.), Strawberry guava (*Psidium Cattleianum* Sabine), Feijoa (*Feijoa Sellowiana* Berg.), Jujube (*Zizyphus jujuba* Lam.), Mulberry (*Morus nigra* L.), Olive (*Olea europaea* L.) and Caper (*Capparis* spp.).

Some hedge plants bear flowers that are rich in nectar which is readily available to the hive bee, and where hedges of any of these are extensively grown they may be of value to bee-keepers. Tagasaste or tree clover

(*Cytisus palmensis* Hutch.), a native of the Canaries, and now grown in California and parts of Australia and New Zealand as a rapid growing hedge or small wind-break, has proved to be a good honey yielder. The Cape Box (*Lycium afrum* L.) is another introduced hedge plant in Australia, naturalised to the extent of being a pest in some parts, that has been well reported on as a honey plant. In New Zealand two Escallonias (*E. macrantha* Hk. et Arn. and *E. pterocladon* Hk.) employed as hedges are claimed to be good bee plants, so also is *Pittosporum eugenioides* A. Cunn. and probably other species of *Pittosporum*. Australian species of *Hakea*, some of them much-used hedge plants in South Africa in earlier days, are much frequented by bees when in flower and they too have spread to the extent of being a nuisance in some areas. The henna plant (*Lawsonia inermis* L.), so much favoured in Mohammedan countries and a most useful hedge plant in the dry tropics, is very attractive to bees with its dense masses of small yellowish-white flowers. The flowers of the Logwood and Guava are also very attractive to the honey bee. Among warm temperate species used as hedges and useful as bee plants are Barberry (*Berberis* spp.), Rosemary (*Rosmarinus officinalis* L.), Firethorn (*Pyracantha* spp.) and Gorse (*Ulex europaeus* L.).

For a defensive hedge or barrier against live stock it is generally found that it is only those plants which are armed in some way or other that prove really satisfactory in the long run. Unarmed species, however dense their growth, usually give way and are forced by animals in the course of time. In the notes that follow, therefore, it is only armed species that are dealt with. The writer is indebted to Miss S. Ross-Craig, Dr. J. Hutchinson and Mr. D. Wheatley for assistance with the illustrations.



Aberia caffra Harv. et Sond.

Aberia

A. caffra Harv. et Sond. (*Dovyalis caffra* Warb.). S. Af. Kei Apple, Kaffir Apple. One of the most useful hedge plants for the sub-tropics ; a sturdy evergreen bush reaching 8 feet or more with stocky jointed growth and pendulous very spiny branches. Female plants yield an abundance of plum-like fruits, not very palatable raw but pleasant enough stewed or made into jelly or jam. The yellow fruits contrast well with the rich dark foliage.

The long thin spines of the older branches may reach 6 inches in length (Kew Bull. 1897, 114), and the plant has been described as " a perfect terror to evil doers be they beasts or human beings." For hedges a 3-feet spacing is deemed sufficient as the plant spreads well at the base. Propagation is usually by seeds, for cuttings do not strike readily, layers from known female plants being used if wanted for fruit. At first growth is slow but soon increases and has been known to be 8 feet after 3 years.

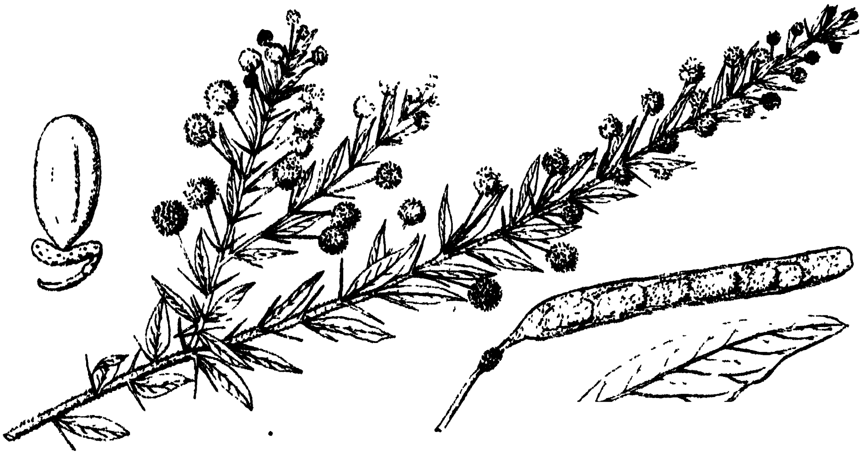
The plant may be grown as a rough boundary fence or kept at any desired height by clipping. It soon becomes stock- and even pig-proof and also affords good shelter. As a garden windscreen it is well suited, not being a gross feeder. In many parts of Australia, including coastal districts of Queensland, it has proved a useful hedge, and it has also been grown in California, the West Indies, and the higher altitudes in East Africa, the Philippines and Ceylon. It does not appear to have run wild or become troublesome anywhere. The plant withstands drought and a certain amount of frost well but is unsuited to the wet tropics.

Acacia

At least a dozen species of this large genus are known to be used as hedges or barrier plants in different parts of the world. They may have straight or recurved spines or spinous phyllodes. A few Australian species without spines are sometimes grown as screens on account of their rapid growth.

A. arabica Willd. Trop. Af. and India. Babul. A common tree in many parts of Africa and India ; sometimes used for field enclosures. In parts of North Queensland it has spread to the extent of becoming a pest.

A. armata R. Br. Australia. Kangaroo thorn. A spreading shrub reaching 10 feet or more, not infrequently used as a hedge plant in the sub-tropics, *e.g.*, California, South Africa, Cyprus, etc. It is best suited as a rough boundary hedge, being of rather straggling and untidy growth. If neglected, it is prone to become a nuisance, covering too much ground



Acacia armata R. Br.

and harbouring vermin, especially rabbits in Australia. With its dense growth and numerous spines, ½ inch in length, it forms a formidable barrier. It withstands drought and dust well and has been used to reclaim sand-dunes. The plant is a variable one. Propagation is by seeds or cuttings.

A. ataxacantha DC. West Trop. Af. Benin Rope Acacia. Used for living barricades round native villages in both forest and inland regions (Dalziel) ; of straggling growth and forming impenetrable thickets.

A. concinna DC. Trop. Asia. A climbing shrub with sharp recurved prickles, found in evergreen forests in India and Burma ; also in Malaya and Java. Is adapted for field enclosures and sometimes grown round villages in India (Cleghorn).

A. cyclops A. Cunn. Australia. A spreading shrub 8–10 feet high with narrow obliquely pointed phyllodes ; compact and attractive when young but as a hedge inclined to become straggling. Successfully introduced into Cyprus (Sampson).

A. Farnesiana Willd. Tropics and Sub-tropics. Cassie or Acacia of Perfumery. Well known and widely distributed and naturalised throughout both hemispheres. In some countries, *e.g.*, Fiji, it has spread to the extent of becoming a pest (" Ellington's curse "). In the Philippines it spreads naturally into grass country (Burkill). It makes a good hedge when properly cut and is well suited for dry areas. Unchecked it reaches a height of about 12 feet.

A. latronum Willd. India. Robber Thorn. Covers large tracts with thorny scrub in the dry hills of the Deccan ; bears two types of thorns, some small and solid, others large and hollow, white in colour. This species has been termed " robber thorn " from the fact that it removes cotton from loaded bullocks that pass through it.

A. longifolia Willd. Australia. Sydney Wattle. Forms a quick-growing though short-lived evergreen hedge ; well suited for large informal hedges or screens ; will thrive in exposed situations and poor soils (Mowry : Sim).

A. modesta Wall. N. India. " Phula." A slow-growing small tree in India ; much used as a hedge there, also in other countries—Burma, Ceylon, South Africa, etc. ; forms a neat and pleasing hedge and thrives in areas of low rainfall. (Agric. J. India, **13,** 347).

A. pennata Willd. Trop. Af. and Asia. A well-armed scrambling shrub sometimes grown as a barricade round villages and fields (Sampson).

A. sphaerocephala Cham. Mexico. Bull's Horn Acacia. Bears large hollow thorns in pairs (tenanted by ants) ; makes a vigorous hedge in the West Indies and the low country of Ceylon and elsewhere, reaching a height of 4–6 feet (Burkill).

A. tortuosa Willd. S. America. Cushaw. A dense prickly shrub well suited to the dry tropics ; has proved a useful quick growing hedge in Barbados and elsewhere ; grows rapidly from seed.

A. verticillata Willd. Australia. Star Acacia : Prickly-leaved Acacia. Possesses sharp-pointed phyllodes and exists in several forms. It has proved a useful evergreen hedge in California (Wyman) and has attracted attention as a utility or farm hedge in New Zealand in the last 20–25 years, particularly around Auckland and the coastal districts of Taranaki (Yeates). Its main advantages are claimed to be its rapid growth (6–8 feet in two years), its suitability for poor soils and its resistance to salt winds. It is not so stockproof as barberry and boxthorn and needs regular trimming to prevent legginess at the base ; sometimes succumbs from severe cutting back.

Some of the more spiny tropical African Acacias (*e.g.*, *Acacia albida* Del., *A. senegal* Willd., and *A. campylacantha* Hochst.) have been considered as live fences, but trials have shown (Bond) that they are slow in becoming established, requiring about 10 years to form a serviceable hedge from seed. They are also eaten by livestock in spite of the thorns.

Aegle

A. marmelos Correa. India. Bael Fruit. A well-known small or medium-sized tree with straight axillary spines ; wild and often cultivated for its fruit ; makes a slow-growing thorny fence ; will endure a fair degree of cold and thrive in comparatively dry areas in N.W. India. Cultivated varieties are sometimes thornless.

Agave

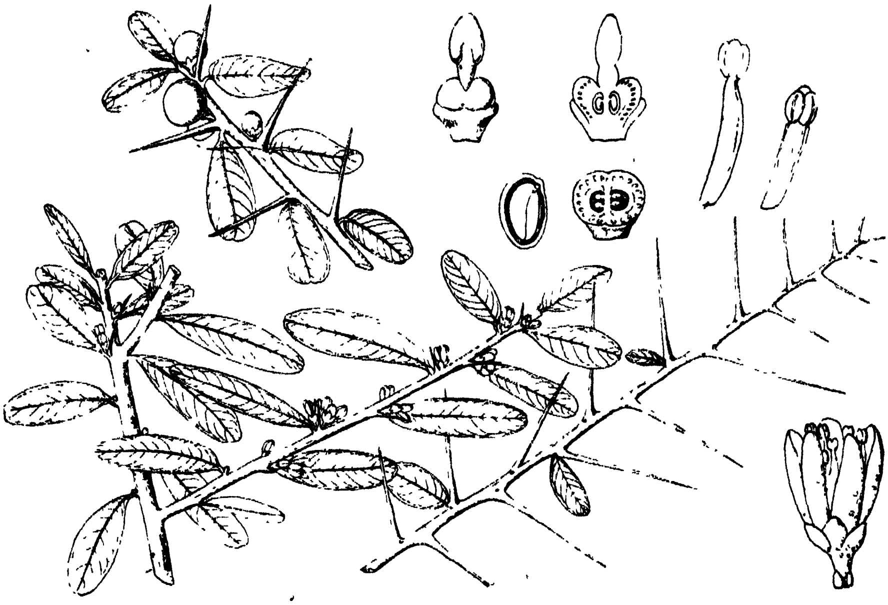
Some of the Agaves are useful and extensively grown barrier plants. As they require little or no care to maintain once they are established they constitute one of the most economical forms of live fence—hence their general popularity. To form an effective barrier they probably require more space than most barrier plants and are ill suited for small enclosures. They are easily propagated from suckers, bulbils and seeds, withstand drought and thrive in poor sandy soils. Their strong fibrous roots are inclined to impoverish the ground for some distance, and fences of the plants are undesirable near gardens or cultivated fields.

A. americana L. Trop. Am. Century Plant or Railway Aloe. Now very widely distributed throughout the warmer parts of the world ; common as a fence plant in India (especially along railway tracks) and in S. Europe, the Canaries, South Africa, Mauritius, the West Indies and elsewhere. It exists in several forms, including variegated, which are used mainly for ornament. In 3 or 4 seasons it usually makes an effective cattle barrier with its pointed leaves. In Rhodesia the natives use it for goat kraals by planting suckers about a foot apart on the top of a 2-foot sod wall. After a single season's growth such a fence effectively stops goats. Like the " prickly pear " (*Opuntia*) this plant thrives best in dry sandy soils. In moist soils barriers of this plant often benefit from a ditch cut alongside them. One drawback is that the plants are liable to harbour vermin, especially rats.

A. angustifolia Haw. Trop. Am. A smaller species than *A. americana*, now widespread in the tropics and much used, especially in India, as a barrier plant. Was common round village forts in the days of tribal raids and warfare in India. The leaves are numerous and sharply pointed.

A. cantala Roxb. Trop. Am. Kantala or Maguey. One of the Agaves exploited for fibre, now common in India, the Philippines, and other parts of the Eastern tropics. Like *A. angustifolia*, it has been used in India for fencing along railway lines and around forts.

A. sisalana Perrine. Mexico. Sisal. This important fibre plant is to be found in most parts of the tropics and subtropics ; although it has been used as a fence plant, it is probably less effective in this respect than other Agaves, owing to its relatively smooth leaf margins, compared with the heavily armed leaf margins of other species. When grown as a fence plant it requires closer spacing (about 4 feet) than in commercial planting, and becomes effective as a barrier after 2–3 years. It has been grown for a dual purpose in some instances—as a barrier and as a source of fibre for local use.



Atalantia buxifolia Oliv. (partly after Seeman)

Atalantia

A. buxifolia Oliv. (*Severinia buxifolia* Teu.). S. China. A shrub or small tree with dark green leaves and a sharp spine at the base of each ; very like *Citrus* with which it is closely allied ; of somewhat straggling growth but of pleasing appearance and suited for a low informal type of hedge ; grown in southern United States (Mowry).

Azima

A. tetracantha Lam. India. A shrub with white edible berries found in the drier parts of southern India, Burma and Ceylon ; in habit resembles gorse (*Ulex europaeus* L.) ; grows freely in all soils ; the spreading branches bearing spines 2 inches long ; adapted for field enclosures (Cleghorn.)

Balanites

The cut branches of *B. aegyptiaca* Del. (Desert Date) are used for fencing cattle enclosures in West Africa (Dalziel). Although formidably armed it is not known that this species is regularly cultivated as a barrier plant. In Northern Nigeria it is said (Bond) to be suitable for cultivation in areas of low rainfall, to grow more quickly than most thorns and not to be eaten by livestock, but to be liable to form suckers.

Bambusa

B. arundinacea Retz. India. Spiny Bamboo. A common bamboo in Southern India and Burma and often cultivated ; may reach a height of 50 feet ; bears sharp curved spines on the branches ; forms a useful hedge or screen for large enclosures ; used for fencing gardens and fields in Coorg and other parts of India and for sugar plantations in Java ; tends to spread into clumps unless its luxuriance is checked ; in hedges the thick young shoots should be removed and the lateral branches only allowed to develop. The surface roots are " greedy " and may spread 20 feet or more.

B. spinosa Roxb. Eastern India. Spiny Bamboo. Very similar to *B. arundinacea* in all its characters ; with constant clipping it forms a dense handsome hedge which may be maintained at almost any desired height. This species " from the number and strength of its branches and spines is said to form the most impenetrable jungle in India " (Cleghorn).

Barleria

B. prionitis L. Trop. Asia and Africa. This small prickly plant, reaching 4–5 feet in height, is often cultivated as a hedge in the tropics, especially in Java and India. It bears showy, yellow or buff-coloured flowers, is well suited to areas of heavy rainfall, and is propagated by cuttings or seeds.

B. cristata L. Trop. Asia. Blue Bell. A small bushy shrub of slender growth forming a low ornamental hedge if closely clipped, but soon becoming straggling if left ; of rapid growth, blooms more or less continuously ; flowers mauve—in some varieties pink or white ; best propagated by cuttings *in situ* in the rainy season.

B. lupulina Lindl. Siam. A species rather similar to *B. prionitis* and used for hedges in Java. In Siam the plant is a remedy for snake bite.

Berberis

Although mainly of interest as hedge plants in temperate regions some species are useful fence plants in warmer climates, the evergreen species being preferred to the deciduous for this purpose. The following are among those that have been grown in warm regions. All are prickly. The barberry is usually avoided in wheat-growing districts, being a host of wheat rust.

B. aristata DC. Himalaya. A strong-growing deciduous barberry, 10–12 feet in height and diameter ; has proved a useful up-country barrier hedge in Ceylon.

B. diaphana Maxim. N.W. China. Sometimes grown as a hedge in the Southern U.S.A.

B. Darwinii Hk. Chile. Darwin Barberry. A well-known garden plant ; used as a medium evergreen hedge in many areas including California ; successful as a hedge in most parts of New Zealand and many parts of South Africa.

B. dictyophylla Franchet. S. China. Used as a hedge in the southern U.S.A. ; has long slender branches and red autumn foliage.

B. Fortunei Lindl. (*Mahonia Fortunei* Fedde). China. An erect evergreen shrub reaching 6 feet, with narrow dull-green leaflets ; slow-growing ; suitable as a hedge plant at the higher altitudes in Java and Ceylon.

B. Fremontii Torrey (*Mahonia Fremontii* Fedde). South-western U.S.A. An evergreen reaching 12 feet ; native of the hot dry regions of Texas, Arizona, etc. ; used as a hedge plant in the Southern United States.

B. pruinosa Franchet. Yunnan. A shrub not unlike *B. aristata* ; grown as a medium evergreen hedge in California (Wyman).

B. stenophylla Moore. Garden origin. This well-known garden plant of temperate regions has also been used as a hedge in warmer climates, *e.g.*, California and South Africa.

B. Thunbergii DC. Japan. A deciduous barberry of very close compact habit well suited as a low fence (4–5 ft.) or ornamental hedge ; has a naturally tight bottom ; grown in all parts of the United States and elsewhere ; many garden varieties exist.

B. vulgaris L. Europe, Asia. Common Barberry. Much favoured in New Zealand (in inland districts of North Island) as a farm hedge for livestock ; soon becomes cattleproof with but little attention. Unfortunately in some areas it has become a pest, through seed being spread by birds. Endless varieties exist, some of very poor habit. A variety with red berries, which it produces only rarely and so does not spread freely, and which is raised by cuttings, has been recommended for hedges in New Zealand. It has the reputation of suckering more freely than the common sort and wider spacing may be used in planting (Yeates).

Bougainvillea

The Bougainvilleas, so extensively grown throughout the tropics and sub-tropics as ornamental plants, and now available in many different varieties or colour forms (Williams), are often employed as barriers or screens.

B. glabra Choisy. Brazil. The Common Purple Bougainvillea. Makes a very effective barrier with its stout thorns and may be quite cattle proof if it is given some sort of support in its early stages and is properly trained. It grows readily from cuttings and stands clipping well. With continuous trimming it becomes dense and impenetrable. Trimming should cease a few weeks before flowering if a floral display is desired. A low wall, which is soon completely covered, makes a very suitable support. If a bamboo trellis or other temporary support is given, by the time this rots the plants are usually sufficiently strong to do without it. The long straggling branches should be cut or tied back in the early stages. The plant needs plenty of space and 6 feet is a suitable planting distance when grown as a barrier. There are several varietal forms of this species in cultivation, differing in the colour of the bracts.

B. spectabilis Willd. Brazil. Rose Bougainvillea. Like the above, this is a well-armed strong-growing woody climber well suited for both wet and dry districts alike. In East Africa the Bougainvilleas succeed up to 7,000 feet.

Bromelia

B. pinguin L. Trop. Am. Pinguin. One of the first Bromeliads to attract attention, being common on rocky hills and savannahs in the

West Indies, especially Jamaica. The narrow leaves bear stout incurved spines. Used for hedges and fences in the West Indies and Tropical America ; well suited for dry soils.

Caesalpinia

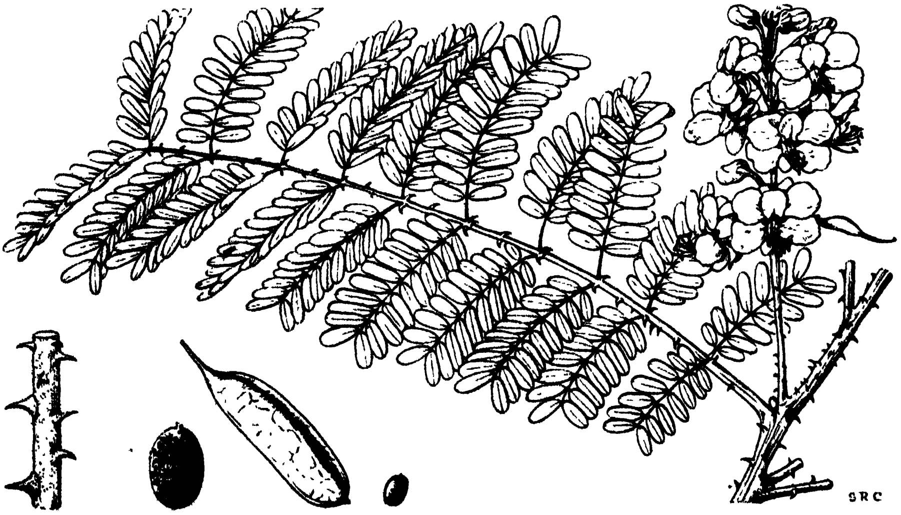
Some of the trees and large woody climbers of this genus have been used in the tropics as hedge plants and are for the most part well armed with strong recurved thorns.

C. coriaria Willd. S. Am. Divi divi. A small South American tree now widespread in cultivation throughout the tropics ; best known for its pods which are a commercial source of tannin ; has proved a useful hedge plant in the West Indies, India and elsewhere ; bears feathery foliage and small sweetly-scented yellow flowers.

C. crista L. (*C. Bonducella* Roxb.). Tropics. Bonduc or Nicker Nut. A woody climber common on the tropical shores of both hemispheres, which, along with *C. jayabo* Maza (*C. Bonduc* Roxb.) is sometimes cultivated. It is of wide-spreading habit but a good barrier plant, especially if trained over a low wall. Much used in Mysore and Canara.

C. digyna Rottl. India. Teri. A prickly woody climber or shrub with yellow flowers which makes a good boundary fence when allowed ample space ; has been so used in India, Malaya and Trinidad (Williams) ; common on old village sites in some parts of India ; pods also rich in tannin and a commercial source.

C. Sappan L. India, Malaysia. Sappanwood. A scrambling shrub developing into a small tree ; if the branches are interlaced it soon forms a strong barrier ; stands cutting well ; if neglected is prone to grow out of bounds ; thrives in the wet tropics ; seedlings may flower and fruit at 18 months ; grows readily from cuttings or stakes ; the heart wood yields a dye.



Caesalpinia sepiaria Roxb.

C. sepiaria Roxb. S.E. Asia. Mysore Thorn. Probably better known as a hedge plant than any of the other scandent Caesalpinias and a popular fence plant in many warm countries. It is of historical interest in India in that Hyder Ali is said to have directed it to be planted round his strongholds. The plant has yellow flowers and stout recurved thorns ; grows readily from seed which should be spaced about 1 foot apart, and soon forms an impenetrable mass ; difficult to maintain as a neat hedge.

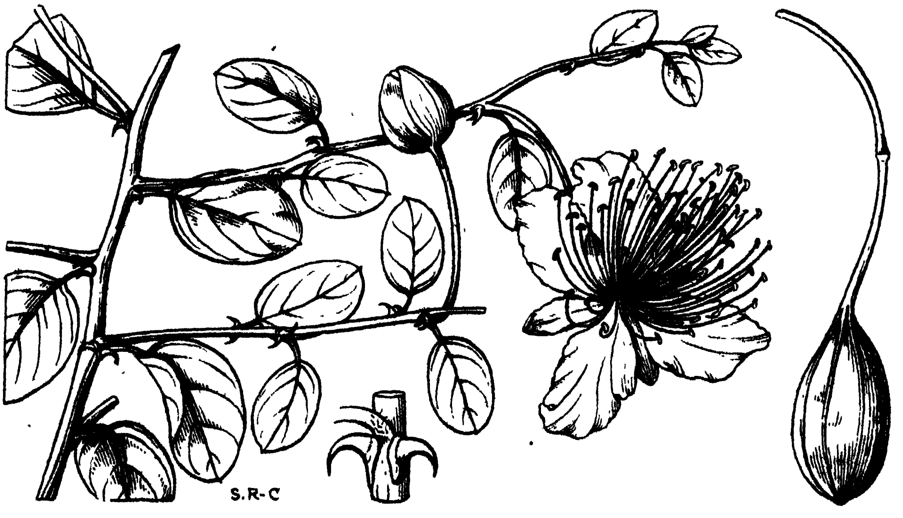
C. spinosa (Mol.) Kuntze (*C. pectinata* Cav.). S. America. Tara. Wild and cultivated : the large reddish pods being used in tanning. The shrub, which bears pleasing foliage and flowers, reaches a height of 12 feet and is often planted for hedges in Peru, a well-grown hedge of it keeping out cattle, pigs or goats, as well as human intruders (Kew Bull. 1931, 95). The plant has been successfully grown in East Africa (Amani) and elsewhere.

Capparis

Some of the shrubs in this large genus are useful as hedge plants in addition to supplying capers. Many have an abundance of thorns. The flowers are also showy.

C. aphylla Roth. Mediterranean Region, India. Caper. A source of capers but not so widely distributed as *C. spinosa* L. ; may be grown as a hedge ; best suited for dry conditions ; propagated by seeds or suckers.

C. sepiaria L. S. Asia. Hedge Caper. A wiry, spreading, much-branched shrub with small leaves, white flowers and black fruits ; reaches about 6 feet in height ; forms a low impervious jungle in parts of India ; grown as a hedge round villages in Mysore ; more compact in habit than most species of *Capparis* ; only needs occasional trimming ; grows readily from seeds or cuttings.



Capparis spinosa L.

C. spinosa L. Mediterranean Region, Asia. Caper. The main source of edible capers ; many varieties exist including some that are unarmed. The bush will form an impenetrable hedge in both dry and wet regions ; the leaves and ripe fruits are eaten by sheep and goats.

Other species of *Capparis*, *e.g.*, *C. zeylanica* L., *C. Moonii* Wight in India, have been favourably reported on as hedge plants for dry areas.

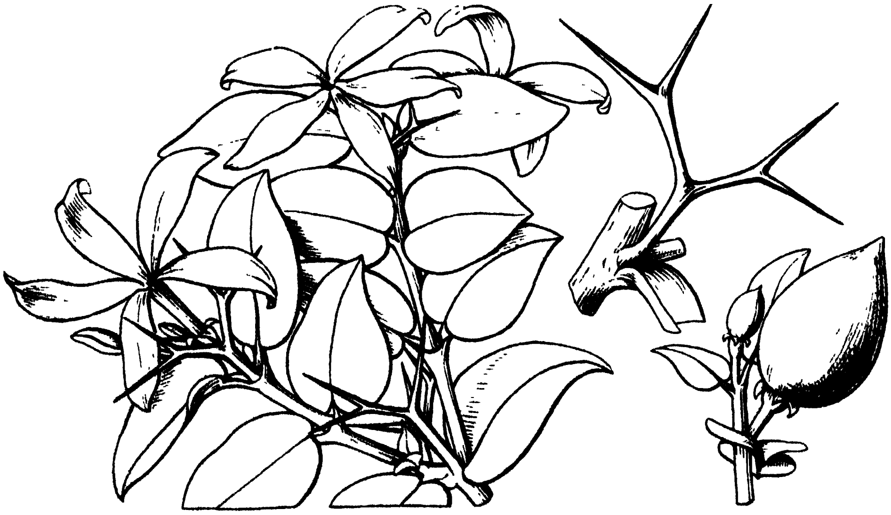
Carissa

This genus of shrubs from the warmer parts of the Old World is well represented in Africa where one or two species have proved valuable hedge plants. They are generally evergreen with sweet-scented jasmine-like flowers. Some have edible fruits.

C. Carandas L. India, Orient. " Caranda," Christ's Thorn, Ceylon Damson. A spiny shrub often cultivated for its edible fruit, which, though acid, makes a pleasant conserve. Many cultivated varieties of it exist. It makes an effective and dense thorny fence and stands pruning well ; cultivated in most parts of India ; not well suited to the humid climate of Malaya (Burkill) ; successful as a hedge plant in the West Indies.

C. edulis Vahl. Trop. Af. A much-branched climbing shrub 6 feet or more in height bristling with strong sharp spines ; has an edible black or purplish fruit ; not uncommon in West Africa and in dry localities in East Africa at 5,000–6,000 feet ; has been grown as a hedge in California.

C. grandiflora A.DC. E. and S. Africa. " Amatungulu " or Natal Plum. A well-known plant in Natal with rich glossy green leaves and purplish-red edible fruits the size of a small hen's egg. Being an evergreen and with a dense close habit and formidable thorns the shrub is much used as a hedge. It grows well on poor sandy soils even near the sea with salt water washing up to its roots ; is easily propagated by seeds, layers or cuttings ; makes a good windscreen, being naturally bushy right to the base and will withstand a certain amount of frost. It is not of rapid growth and is better suited to sub-tropical than tropical conditions ; has proved a good hedge plant in California, the West Indies, Sudan, parts of India, and Queensland.



Carissa grandiflora A.DC.

C. spinarum A.DC. India and Ceylon. A dense thorny shrub common in many of the drier parts of India and Ceylon ; very similar to *C. Carandas* but smaller. In Ceylon it often completely covers large areas of ground. The dried branches are used for fencing round fields and plantations and are even alleged to keep out elephants (Lewis).

Chaenomeles

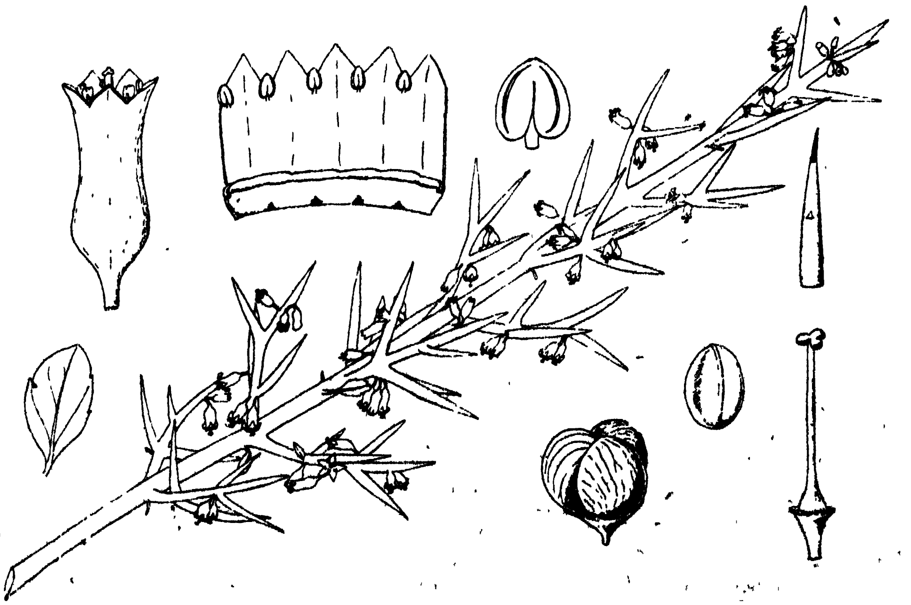
C. lagenaria (Loisel.) Koidz. (*Cydonia japonica* Pers.). China and Japan. Japanese Quince. This dense bushy shrub, much cultivated for ornament and reaching a height of 10 feet, is sometimes grown as a hedge. Its dense and strong woody spines render it effective as a fence plant, becoming with age, as one writer states, " quite boy and dog proof ! " It stands pruning well and may be clipped to any shape ; will tolerate drought and frost. Suckers freely under poor soil conditions. Numerous garden varieties, differing mainly in flower colour and fruit characters, are in cultivation.

Citrus

C. aurantiifolia Sw. (*C. medica* var. *acida*). Tropics. The common lime, perhaps the most tropical of the Citrus fruits, is often grown as a hedge plant. It stands pruning well and needs to be well clipped to form a satisfactory hedge. Normally it is a small, evergreen, and intensely spiny tree. As a hedge it is favoured in many parts of India and in West Africa and the West Indies. A deep soil and high rainfall suits the plant best. It is unsuited for shallow soils. In planting, seed is sometimes sown *in situ* to avoid disturbance of the tap root. The lime is naturalised in some parts of the tropics.

C. Limonia Osbeck (*C. medica* var. *limonium*). Tropics and sub-tropics. Lemon. The ordinary lemon or rough lemon, which is better suited to the sub-tropics than the Lime, has been used as a barrier or boundary hedge in some areas, notably Queensland. In Fiji and probably other countries it has become quite wild. With favourable growth plants spaced 18 inches apart form a hedge in 4–5 years that no man or beast will penetrate (Kew Bull. 1896, p. 188).

Some of the Citrus allies (*e.g.*, *Atalantia*, *Triphasia*), with their dark evergreen foliage and spiny stems, are useful hedge plants.



Colletia armata Miers

Colletia

C. cruciata Hk. Uruguay. An unusual shrub of peculiar appearance reaching a height of 10 feet, sometimes cultivated in Britain and other temperate countries. It is formidably armed, and the thorns, which are in pairs, may be of two kinds—the one bodkin shaped, sharp and slender, the other flat, triangular, rigid, and about 1½ inches wide at the base. The shrub is quite impenetrable and has been used for hedges in Ceylon at 5,000–6,000 feet. Other species of *Colletia* such as *C. armata* have a similar habit and might also be tried in the sub-tropics for hedges. They are normally slow growing.

Commiphora

C. africana Engl. (*Balsamodendron africanum* A. Rich.). Trop. and N. Af. African Myrrh. A shrub or small tree sometimes very plentiful and occurring in all sorts of situations, including poor sandy soils, crevices of rocks, etc. A gum-resin is collected from the trunks after slashing. The stout woody spines are modified branches and bear leaves. Small greenish-red flowers are borne in clusters. In some areas, *e.g.*, Northern Nigeria, it is often used as a hedge plant and soon forms an efficient barrier, especially when grown from stakes or truncheons as is often done. It is well suited to dry areas and has much the habit of the Blackthorn (*Prunus spinosa* L.), with rigid twigs branching in all directions.

C. Berryi Engl. Trop. Af. and India. This dense and spiny shrub—sometimes a small tree—is much used in the drier parts of southern India and Ceylon as a barrier plant. It resembles *C. africana* in general characteristics ; has lateral branches ending in abrupt spines, and the bark peels off in silvery shiny scales. The plant is said to be unsuited for wet districts where it loses much of its spiny character.

Other species of *Commiphora*, especially among those in the hot drier parts of Africa, may be found to make useful hedge plants in the dry tropics. *C. stolonifera* B. D. Burtt, a very spiny species reaching 10 feet in height and peculiar for its vegetative reproduction by the rooting of the branch tips, has been suggested as a useful live fence on hard pan soils in East Africa. It soon becomes impenetrable to all the larger animals except elephant and rhinoceros (Kew Bull. 1935, 115).

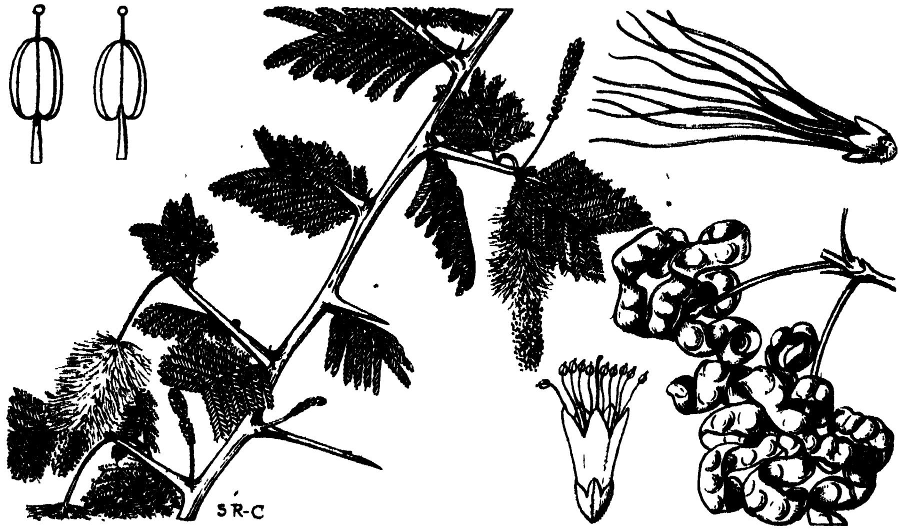
Crataegus

C. monogyna Jacq. Europe. Common Hawthorn or May. The value of the Hawthorn as a fence plant in Europe and America is well known. In other countries where it has been introduced it has not always fulfilled expectations. The early settlers in New Zealand made free use of it as a hedge plant, appreciating its steady growth, long life and resistance to stock. Later it was realized that in the mild climate of New Zealand it was subject to many pests and diseases some of which (*e.g.*, fireblight disease) attacked fruit trees or other cultivated plants. Further planting in New Zealand was prohibited under the Noxious Weeds Act (N.Z. Agric. Jour. **23**, 284). In the cooler and moister parts of southern Australia it has proved a good hedge plant although inclined to spread rather freely into uncultivated land. In the warmer coastal districts it soon becomes straggling and open at the bottom, offering no resistance to sheep.

C. monogyna Jacq. is usually preferred to *C. Oxyacanthoides* Thuill. for hedging, being more formidably armed.

Dichrostachys

D. cinerea DC. Old World dry Tropics. A rigid shrub like a dwarf *Acacia* common in many of the arid parts of the tropics—India, Ceylon, Africa and N. Australia. It bears strong sharp axillary spines sometimes extended into branches and has yellow or whitish flowers and peculiarly twisted pods. Growth is erect though slow, and the plant is a useful barrier hedge in the dry tropics. The closely allied *D. glomerata* (Forssk.) Chiov. (*D. nutans* Bth.) of tropical Africa has been introduced and become a pest in the West Indies.



Dichrostachys cinerea DC.

Duranta

D. repens L. (*D. erecta* L., *D. Plumieri* Jacq.). Trop. Am. Pigeon Berry, Duranta. One of the most widely cultivated hedge plants in the tropics. Exists in many forms and varieties differing in flower colour, leaf size and degree of spinosity. Unchecked it grows to 10 or 15 feet and bears purple (sometimes white) flowers, yellow berries (poisonous) and shining evergreen leaves. As a roadside plant or hedge plant an important feature is that its smooth shiny leaves never collect dust. Generally only the young branches bear thorns. The plant is propagated readily from cuttings but seed may also be used. It is a quick strong grower and needs much clipping to be maintained as a neat low hedge. In exposed positions and in the sub-tropics, *e.g.*, Southern Rhodesia, it may be deciduous. When well grown and kept bushy it is quite cattle proof, 3 seasons' growth being sufficient. It suffers little from pests or disease. As a high informal hedge or screen with plenty of room available it is very satisfactory, especially as it flowers for so long.

Erythrina

In this large genus with over 100 species, mainly trees or shrubs distributed in the warmer parts of both hemispheres, there are many species well known in cultivation. On account of their general thorny nature, rapid growth, and the ease with which they may be propagated from large cuttings, branches, or stakes, they are often employed as fence plants. Some are grown for ornament on account of the large red flowers which often appear when the tree is leafless in the dry or the cold season. Others are used as shade and green manure plants for plantation crops in the tropics, or as support for pepper or betel vines, the thornless races being preferred for this purpose.

In the Eastern or Asiatic tropics species grown as fence plants include *E. indica* Lam., the Dadap, with black thorns, very widely cultivated, *E. stricta* Roxb., and *E. suberosa* Roxb., with whitish or light brown prickles on the young branches.

In tropical Africa, *E. senegalensis* DC. and *E. tomentosa* R. Br. are among the indigenous species suitable for and sometimes used as barrier plants, the former being common in the west and the latter in the east and southern parts of the Continent. In West tropical Africa *E. senegalensis* is planted as a fence tree in villages and grows rapidly from large stakes. *E. tomentosa* is widespread in East Africa from sea-level to 7,000 feet. It is well suited to dry areas and not infrequently used as a fence plant by natives. It extends to Southern Rhodesia. In South Africa *E. caffra* Thunb., the common "Kaffir boom," is sometimes used by natives round their kraals.

In tropical America and the West Indies species of *Erythrina* have been used as fence plants from early times on account of their usually well-armed branches and showy red flowers. The Aztecs are reputed to have used them extensively in this way, just as they are still used in modern Mexico (Krukoff). *Erythrina Corallodendrum* L., the " coral " or " jumbie bead " of the West Indies, is much used as a barrier, so also is *E. glauca* Willd., "water immortelle" or "bocare," and *E. pallida* Britt. et Rose. Other species reputed to be used in the American tropics are—*E. Buchii* Urban, *E. Eggersii* Krukoff et Moldenke, *E. Folkersii* Krukoff et Moldenke, *E. lanata* Rose, *E. leptopoda* Urban et Ekman, *E. Standleyana* Krukoff and *E. velutina* Willd. (Krukoff).

Euphorbia

The succulent or cactiform Euphorbias are often used as fence plants, being usually well adapted to dry conditions and poor soils, easily propagated from cuttings and of fairly rapid growth in most situations. Many are well armed and not nibbled by stock in the young stages owing to the acrid latex they contain. This milky latex has given rise to the term " milk hedge " often applied to these plants.

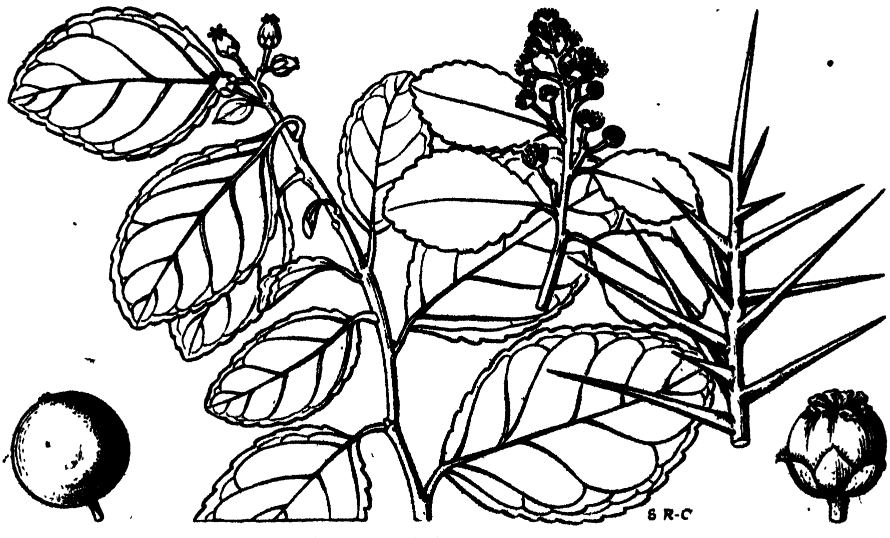
E. antiquorum L. This shrub or small spreading tree may reach 20 feet in height under favourable conditions and has stiff 3–6-angled branches and spinous stipules. It is often grown in the dry tropics of the East as a fence plant : so also is *E. neriifolia* L., which roots readily from large branches. The short sharp spines at the base of each leaf and the plant's compact habit when grown as a hedge combine to form a very effective barrier. It has proved a satisfactory hedge in the West Indies, as has *E. lactea* Haw., another well-armed Indian species.

Several of the African species are utilized by natives for their enclosures. In West tropical Africa *E. kamerunica* Pax (*E. Barteri* N.E. Br.) is one of the most commonly used species, often to be seen as a stockade round villages and cattle kraals in the northern savannah areas. Old stockades and fences around native farms in northern Nigeria that have been well cared for and supplied are stated (Bond) to be absolutely impenetrable. There it is considered to require about 50 inches of rainfall for good growth, but may also occur wild in dry rocky places and reaches a height of 20 feet.

Other indigenous species grown in West Africa as hedges and boundaries are *E. balsamifera* Ait. and *E. lateriflora* Schum. et Thonn. The former is a shrubby species branching close to the ground and easily raised from cuttings. According to Bond it is one of the best fence plants in the low rainfall areas (less than 35 ins.) in northern Nigeria and does best in a deep sandy soil. It does not form a completely stock-proof hedge on its own, but gaps between plants may be filled with dead thorns. It is immune to attack by termites and not eaten by stock. *Euphorbia lateriflora* is also a dense shrub, not eaten by stock, which thrives under the same soil and climatic conditions as *E. balsamifera*, but is of slower growth and not so easy to establish (Bond).

Euphorbia splendens Boj. (Christ's Thorn) is a small thorny shrub with bright red bracts, a native of Madagascar, and well known as an ornamental plant in warm countries throughout the world. It is often grown as a low hedge or edging plant.

E. Tirucalli L., although unarmed, is freely grown as a rough hedge or boundary plant in the tropics and subtropics of the Old World. In East Africa especially it is common as a village stockade plant. Apart from its rapid growth, its vigour in almost any soil and ease of propagation from large cuttings, it has little to recommend it as a fence plant. If not regularly clipped it becomes open at the base. In India *E. antiquorum* is sometimes planted where gaps occur and grows well under *E. Tirucalli* shade, while together they form a serviceable enclosure.



Flacourtia indica Merr.

Flacourtia

F. indica Merr. (*F. Ramontchi* L'Hérit). Trop. Asia and Africa. Governor or Madagascar Plum. Occurs as a small deciduous tree in the natural state with spiny twigs and stout branched spines on the trunk ; sometimes cultivated for its edible purple fruits—favoured mainly for preserves. As a hedge plant it is much used in the West Indies and elsewhere and forms a close impenetrable hedge, responding well to frequent trimming. Many varieties exist. In some the young leaves are red. It is easily raised from seed ; has become naturalised in Mauritius and been grown in parts of South Africa ; will grow on poor dry rocky soil.

Other species of *Flacourtia* which have been used as hedge plants but which are not so well known are *F. flavescens* Willd. (Niger Plum) and *F. Vogelii* Miq. in West Africa, *F. inermis* Roxb. in Malaysia (cultivated as a fruit tree in Java) and *F. sepiaria* Roxb. in India and Ceylon.

Fouquieria

F. splendens Engelm. Mexico. Ocotillo. A shrub with naked wand-like thorny branches reaching 10 feet in height, sometimes used for poles and wired for fencing where it occurs. It was also exploited for wax at one time (*India Rubber World*, **53,** 9). As the plant is very well armed, coppices freely, and grows naturally in sandy desert-like areas, it may have possibilities as a barrier plant in arid regions where few other plants will thrive.

Furcraea

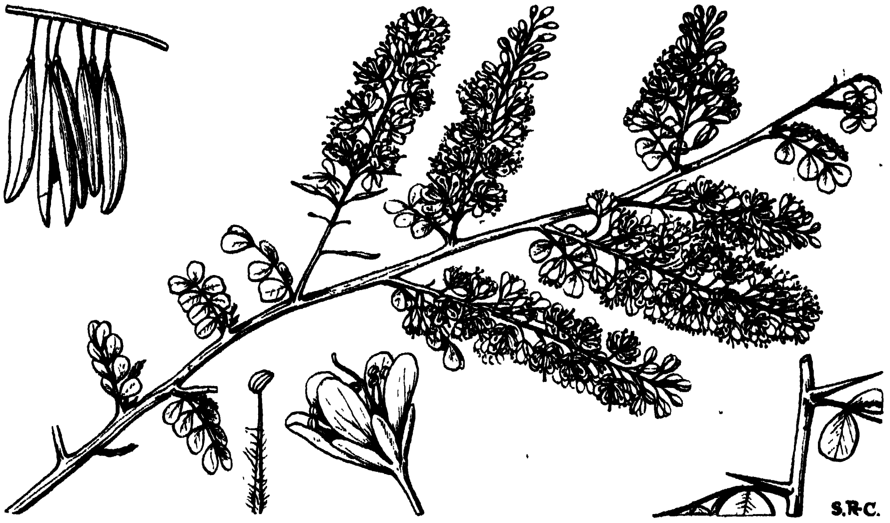
F. gigantea Vent. Cent. America and West Indies. Mauritius Hemp. A well-known fibre plant, but now cultivated mainly as an ornamental or barrier plant in the tropics and subtropics. With its large prickly and pointed leaves it can form a very effective barrier which no animal will penetrate, especially if planted in double rows. The awl-like leaf point is not so formidable as in *Agave*. The plant grows well in dry situations, thrives under similar conditions to sisal and is equally readily propagated by bulbils or suckers. A drawback is that after a number of years plants flower or pole and generally die afterwards. Barriers, therefore, need to be properly maintained and re-stocked where necessary. Mauritius hemp was freely planted as a live fence along railways in Ceylon at one time and has been effectively used as a barrier plant in many parts of the world. Variegated forms are sometimes cultivated for ornament.

Gleditschia

G. triacanthos L. East and central U.S.A. Honey Locust. A large deciduous tree exceeding 100 feet in height in the wild state, with trunk and branches armed with strong sharp spines 3- 12 inches long and usually branched. The young plants stand pruning and cutting back well and may be made to form useful protective hedges. It succeeds over the whole U.S.A. and is especially valuable in semi-arid regions ; has proved an effective wind-break in sand-dune fixation in Texas. In parts of southern Europe it is appreciated as a hedge plant, and in Australia (N.S.W.) it has proved a vigorous grower and a good plant both for hedges and wind-breaks, providing shade and protection for stock. It is also claimed to be especially useful for pigs, the pods affording nourishing food. Plants are easily raised from seed. In Britain seed seldom ripens properly, although the tree grows freely. Some unarmed varieties are in cultivation.

Gymnosporia

G. emarginata Roth. India and Ceylon. A shrub found in Western Peninsular India and in the hot dry parts of Ceylon. It has stout zig-zag branches bearing numerous spines 1–2½ inches long and tough leathery leaves. It is said to be suitable as a boundary or barrier plant at low elevations in Ceylon (MacMillan).



Haematoxylon campechianum L.

Haematoxylon

H. campechianum L. Cent. America. Logwood. This small tree is now in cultivation in most parts of the tropics, being long naturalised in the West Indies, and has proved very successful as a hedge, not only as a defensive but also as a screen or ornamental hedge. It has the advantage of being evergreen and bears showy foliage and scented yellowish-white flowers. It stands pruning well and will grow in dry areas. For a tropical plant it is sometimes slow in growth but may reach 4–5 feet in two years. Seeds are best sown *in situ.* The plant has become naturalised in some parts of the Old World (Mauritius). It is a valuable bee-plant yielding good quality honey.

Hakea

Several species of this large Australian genus are grown as ornamental shrubs or as hedge plants throughout the sub-tropics. Some have become naturalised and spread to the extent of becoming a pest, the winged seed assisting dispersal. This has been the case in parts of New Zealand and South Africa. The stems are thornless but the leaves are generally terminated by sharp spines.

H. acicularis R.Br. N.S.W. Forms a stock-proof hedge in its early stages with its needle-like leaves, but becomes open and straggly if neglected ; has become a pest in North Auckland but is reputed to be still used to some extent on consolidated sand dune country (Yeates).

H. gibbosa Cav. N.S.W. A shrub with rigid, needle-like leaves 1–3 inches long. Much used as a hedge in earlier days in South Africa especially in Johannesburg, growing in the poorest and driest of soils and forming an effective barrier ; is rather unattractive and prone to collect dust in the dry season.

H. linearis R.Br. W. Austr. A bushy bright-green shrub with thick sharp-pointed leaves up to 2 inches long and sometimes bordered with small prickly teeth ; has long been naturalised on the Cape Flats and much used as a hedge in South Africa.

H. suaveolens R.Br. W. Austr. An erect shrub 5–6 feet high with terete pointed leaves (mostly pinnate) up to 4 inches long. Grows very quickly and may be sheared to any shape ; also a popular hedge plant at one time in South Africa.

Ilex

Some of the hollies are suited for cultivation in the sub-tropics, evergreen species being usually favoured as hedge plants. The common holly, *I. Aquifolium* L., usually fails in warm regions and becomes a prey to scale insects.

I. cornuta Lindl. China. Horned Holly. Characterised by 5–9 horn-like spines on the large leaves. Of slow growth but neat compact habit. Grown as a medium evergreen hedge in California.

I. crenata Thb. Japan. Japanese Holly. Like the above grown as a hedge in southern U.S.A. ; many varieties cultivated.

I. opaca Ait. E. and Central North America. American Holly. Reaches 50 feet in the wild state and is not unlike the common European Holly, the leaves with remote spiny teeth. Suitable as a hedge when properly pruned.

I. vomitoria Ait. S.E. North America. Cassena, Yaupon. A neat evergreen shrub which has been grown as a hedge in southern U.S.A.

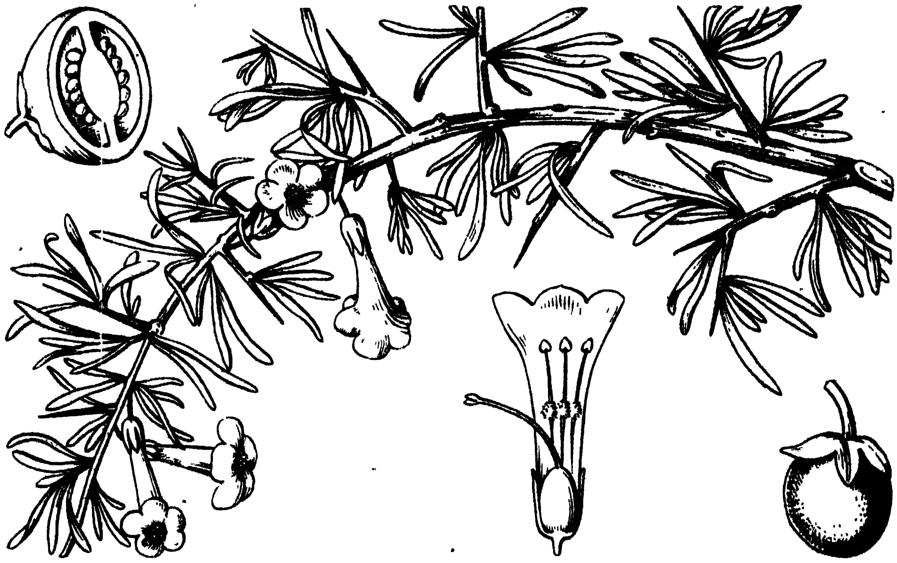
Jacquinia

J. ruscifolia Jacq. West Indies and Mexico. A shrub with shining evergreen foliage and bright scarlet flowers said to make a successful hedge plant in fair soil, with slow bushy growth and prickly leaves.

Lantana

L. camara L. Trop. Am. Lantana. This well-known shrub is now cultivated or naturalised throughout the tropics and many parts of the sub-tropics. In some countries it has become a troublesome weed—as in Ceylon and Fiji. Many cultivated or garden forms exist showing marked differences in habit and flower colour—usually some shade of orange, red or purple. In some badly eroded areas the plant has fulfilled a useful function by colonising and covering the ground, thereby helping to restore humus and fertility. On the other hand in some cut-over forest areas it has proved a nuisance by preventing or arresting further regeneration, seed being rapidly spread by birds.

As a hedge plant it has many desirable points and is often used as such, its dense prickly growth rendering it quite impenetrable. As an informal hedge where there is plenty of room for its free development, it is well suited, especially if cut back occasionally. It stands pruning well. As a flowering hedge it needs to develop width to be satisfactory. It is sometimes used as a mixed hedge with other plants. Dwarf forms are preferred for low garden or interior hedges. The plant is evergreen, at least in most areas and may be propagated from seeds, cuttings or suckers. It has been suspected of poisoning stock.



Lycium afrum L.

Lycium

Lycium afrum L. South Africa. African Boxthorn, Bokdoorn. A low-growing prickly shrub of the Cape with small bright-green leaves, purple flowers and orange-red berries. It has been used for hedges in South and East Africa, also in various parts of Australia and New Zealand. Unchecked and in good soil it may reach 15 feet in height and be of similar width. The plant is easily raised from seed, grows quickly and soon forms a completely stock-proof barrier, in some cases in 3–4 years. It was in great esteem as a hedge plant when first introduced to Australia, but in some parts it has spread to the extent of becoming a pest and has been declared a noxious weed. On the other hand in some areas it has not spread at all. The fruits are eaten by birds and the small seeds (2,000 to the ounce) spread in this way. In most localities the shrub is evergreen but drought or frost may cause it to be deciduous. As a hedge it is difficult to trim, the ripened wood being too tough for an ordinary slasher. If trimmings are left lying about the tough stout spines will easily penetrate an animal's foot, even the hoof of a horse. Wounds from them are slow to heal. Branches blown off in high winds may become entangled in sheep's wool. Roots may travel 20–30 feet laterally, so the plant is unsuited as a garden hedge.

It is probably in parts of New Zealand that this plant has proved of greatest value as a live fence and as a shelter for stock, especially in coastal farming districts subject to salt-laden sea breezes. In some of these 95 per cent. of farm shelter now consists of boxthorn (Yeates). With neglect it does not deteriorate or develop gaps, although it may increase in width to occupy more ground than is desirable. It has proved disease-free but does not thrive on poor gravelly soils. The flowers are reputed to be a good source of nectar for bees.

Malpighia

M. glabra L. W. Indies and Trop. Am. Barbados Cherry. A favourite hedge plant in the West Indies and frequently cultivated in the tropics for its acid, cherry-like fruits which are eaten raw, cooked or as jam. Being well armed and dense in habit it makes a good live fence up to 10 feet. It is evergreen, bears handsome crimson flowers about ½ inch across and is usually propagated from seeds—sometimes cuttings. It has been grown in Florida, South Africa and other parts of the sub-tropics.

M. coccigera L. West Indies. This small evergreen shrub makes a useful low hedge in the tropics. It is evergreen with spinescent leaves, suggestive of holly, and has pink flowers. It is used for hedges in the uplands of Java and is often cultivated in Malaya, especially as a pot-plant by the Chinese who train it into grotesque shapes.

Mimosa

M. rubicaulis Lamb. India. A straggling shrub common in most parts of India, except the arid region, and ascending to 4,000 feet in the outer Himalayas. The branches and leaf-stalks are covered with sharp curved thorns, and the flowers are pink or purple changing to white. The plant is said to be capable of forming an elegant fence (Cleghorn). Possibly other species of *Mimosa* in India could be similarly used (Kew Bull. 1920, 1).

Oncoba

O. spinosa Forssk. Trop. and S. Africa. A common shrub in many parts of Africa sometimes cultivated for its small gourd-like fruits, and armed with slender axillary spines 2 inches long or more. It has been cultivated for ornament and as a hedge, but for the latter purpose is described as indifferent (Dalziel).

Opuntia

O. Dillenii Haw. Subtrop. America. Prickly Pear. Widely spread throughout the warmer parts of the world, often as a noxious weed though in recent years brought under insect control in some areas. Much used as a fence plant, especially in bygone days. In some South American countries and in India it was used round fortifications and considered an important means of defence. Tipu Sahib is said to have strengthened the defences of Seringapatam by planting a good depth of this *Opuntia* round the fortifications. It is also used for cattle and field enclosures in some countries, *e.g.*, West Africa and the Canaries.

As a fence plant its advantages are the facility with which it is propagated and its rapid growth, its ability to thrive in the poorest and driest of soils and the degree of protection afforded by its spinosity. Its drawbacks are that it spreads rapidly, encroaches on fields, is difficult to control and impoverishes the soil for some distance around. It is very apt to harbour snakes, rats or other vermin. As a fence plant it is probably in less frequent use now than formerly.

Other species of *Opuntia* have been used as barrier plants but for the most part have similar drawbacks.

Opuntia ficus-indica Mill. has long been used in the Mediterranean region as a fence plant. It is also used in Mexico along with *O. tuna* Mill.

and various other *Opuntia* allies and arborescent *Cactaceae*. These include *Pachycereus marginatus* Britt. et Rose, known as " organo " or organ cactus and much used as a barrier. *Lemaireocereus hollianus* Britt. et Rose (" baboso "), *Pereskiopsis spathulata* Britt. et Rose (" patilon "), *P. Chapistle* Britt. et Rose and *Nopalea Karwinskiana* Schum. A good account of the use of these species as fence plants in Mexico has been given by Diguet.

Osmanthus

O. Aquifolium Siebold. Japan. This holly-like evergreen shrub with prickly leaves has been used as a medium hedge in California (Wyman). It is often mistaken for holly. Many garden varieties exist.

Paliurus

P. Spina-Christi Mill. (*P. aculeatus* Lam.). S. Europe to China. Christ's Thorn, Jerusalem Thorn. A spreading spiny shrub up to 10 feet high, very like *Zizyphus Spina-Christi* in general appearance. Two stipular spines are present at the base of the petiole, the one straight, the other hooked and recurved. Small greenish-yellow flowers are followed by peculiar-shaped fruits. The shrub is sometimes used as a hedge plant, especially in eastern Europe. It is also cultivated for its legendary interest.

Pandanus

Several of the Screw Pines, so well represented in the Old World tropics, are used as boundary or fence plants. The leaves of some species may be as much as 12–15 feet in length and well armed. The prickles may point forward in one line and backward in another, constituting a very effective armament. In some countries the leaves, with prickles removed, are much used for matting. Most species are easily propagated from cuttings or large branches in the humid tropics and so form a live fence in a very short time. The short-stemmed species are not unlike large Bromeliads. They are sometimes usefully employed as wind-breaks.

P. foetidus Roxb. India and Ceylon. A prostrate species 3–5 feet high with glaucous green leaves 4–6 feet long, bearing short sharp spines along the edges ; has evil-smelling flowers ; sometimes common in tidal forests and wet places ; frequently planted near fields and as a boundary plant in Ceylon (Lewis).

P. tectorius Sol. (*P. odoratissimus* L.f). Trop. Asia. Pandan. A common plant near the sea shore in the eastern tropics and Polynesia ; much branched with bent stem sometimes reaching 25 feet, but more often shrubby ; leaves 3–5 feet long with strong spines on margins and midrib ; much cultivated not only as a fence plant but for matting material and for its fragrant flowers. Many cultivated races exist, some thornless. In sheltered positions with good rainfall it makes an excellent barrier. It is sometimes grown round paddy fields. The mass of prickly leaves lying across one another is difficult or impossible to penetrate, but the plant has the reputation of harbouring rats. It is a common boundary plant in Mauritius.

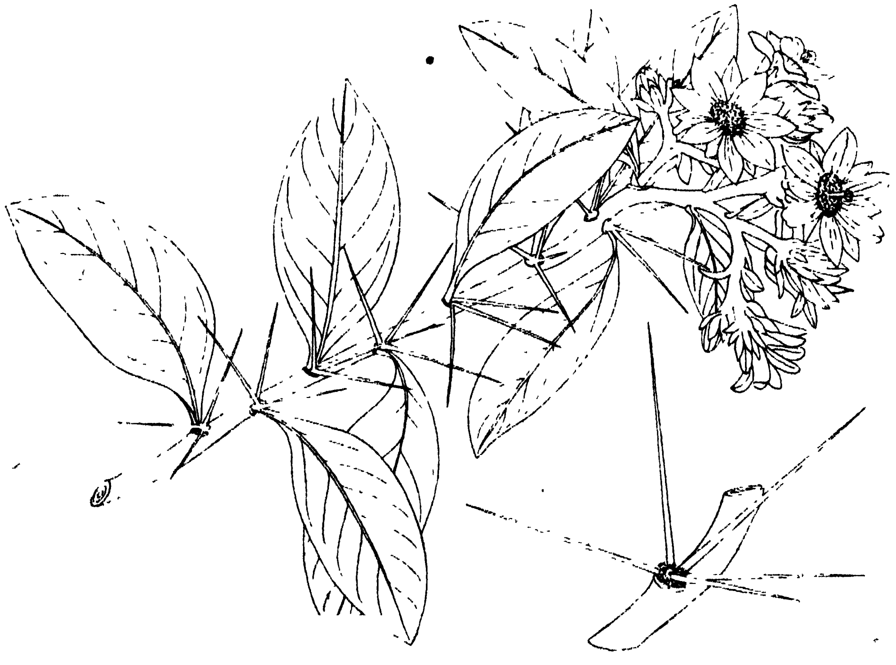
P. zeylanicus Hk. f. Ceylon. This slender screw pine with narrow prickly leaves up to 4 feet long is often planted as a boundary plant and round the margins of paddy fields in Ceylon. Although occurring in moist places it is said to be suited for dry regions (MacMillan).

Parkinsonia

P. aculeata L. Trop. Am. Jerusalem Thorn. Normally a small tree with wiry drooping branches covered with short sharp spines and bearing attractive bright-green feathery foliage and yellow flowers. It has proved an excellent hedge plant, and is freely used for this purpose in the tropics and many parts of the sub-tropics such as the Sudan, S. Rhodesia and parts of South Africa. It has become naturalised in Queensland, Mauritius, Ceylon and Burma (almost a pest). The plant is well suited for dry regions and, kept well clipped, forms a neat impenetrable hedge becoming quite cattle-proof. It is essential that the plant be kept cut back, for if allowed free growth it becomes gappy at the base. Planting alternately with Barbados Pride (*Caesalpinia pulcherrima* Sw.) gives a good hedge in dry districts. The foliage is reputed to be eaten by goats in some areas, whereas in others the statement is made that it is not eaten by stock. Plant are raised from seed, which is best placed in boiling water before sowing.

Pereskia

P. aculeata Mill. W.I., S. Am. Barbados Gooseberry, Lemon Vine. A very spiny plant, shrubby at first, but developing long straggling branches up to 20 feet or more in length. These may be trained to form an effective hedge, especially as the spines are very numerous, the older ones being about 2 inches long. The flowers are 1–1½ inches broad, white or pink and usually opening in the morning and fading by midday. The small lemon-coloured fruits are useful for stewing. A variety with crimson-coloured young leaves exists.



Pereskia grandiflora Haw.

P. grandiflora Haw. Brazil. A shrub 10–12 feet high with a woody spiny trunk and spreading fleshy branches. Grown as a hedge it forms an impassable barrier in a short time, and is so used in South America, its black spines, an inch long, being very strong. It is well suited to dry regions and is more or less continually in leaf and flower. The flowers are rose-coloured and the fruits pear-shaped. It is sometimes cultivated as "*Pereskia Bleo.*"

Pisonia

P. aculeata L. Tropics. Cockspur or Fingrigo. A strong climbing shrub common in the tropics of both hemispheres, especially near the sea shore and sometimes forming impenetrable thickets. It is armed with sharp more or less curved thorns in the axils of the leaves and bears peculiar sticky fruits. The plant is well adapted and suitable for live fences, as would be expected from its habit and its numerous crooked thorns.

Pithecellobium

P. dulce Bth. (*Inga dulcis* Willd.). Trop. Am. Madras Thorn, Manila Tamarind. In spite of its common name this thorny tree is a native of central America. It is now commonly grown throughout the tropics as a hedge and has become naturalised in some areas, *e.g.*, India, Ceylon and Mauritius. It forms a neat evergreen ornamental hedge when regularly trimmed. If not pruned it soon runs wild and becomes open at the base. Cutting at about 2-month intervals is usually sufficient when used for an enclosure. It thrives in a deep soil, seeds being best sown *in situ.* Under favourable conditions it may become impenetrable in about a year. The plant will grow on poor sandy soils but does not thrive in the humid tropics, *e.g.*, Singapore (Burkill). Much planted in the Madras Presidency at one time (along railway lines) where it flowers in the cold season. In hedge form it resembles a hawthorn (*Crataegus*) hedge and has similar stipulary spines.

P. Unguis-cati Bth. W.I. and Trop. Am. Bread-and-Cheese Plant. An almost evergreen shrub reaching 10 feet, with compound leaves and a short spine at the base of each. The greenish-yellow flowers are scented and ornamental while the small black seeds are used in ornamental seed work. Much used as a hedge plant in the West Indies and is not eaten by stock (Williams). As a hedge plant it stands cutting well and will grow under poor conditions.

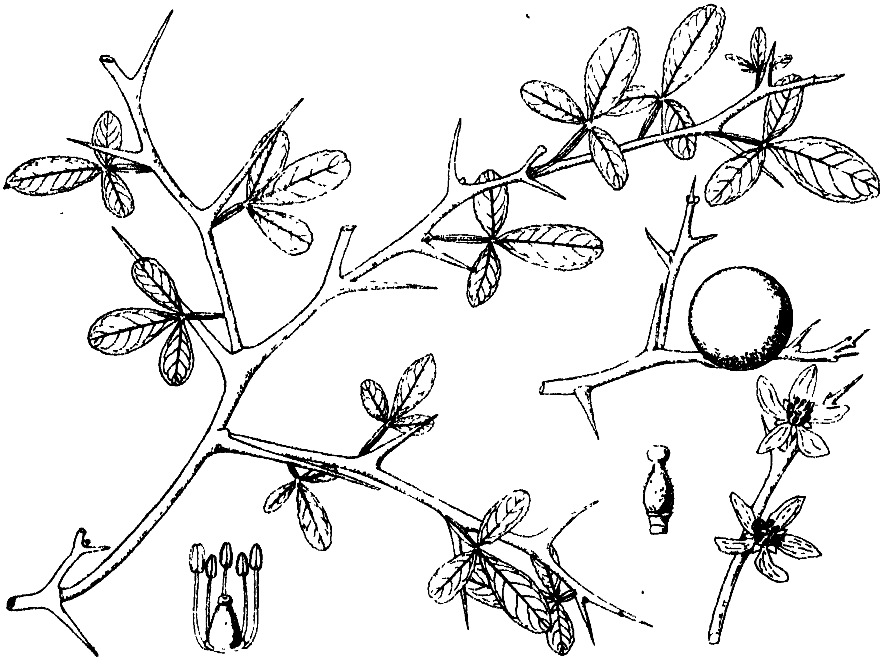
Poinciana

P. pulcherrima L. (*Caesalpinia pulcherrima* Sw.). Dry Tropics. Barbados Pride, Flower Fence. A quick-growing shrub of 10–12 feet, in general cultivation throughout the tropics, being highly ornamental with its orange-red or yellow flowers and delicate feathery foliage. It is only sparingly armed but is hardy and will thrive under almost any conditions. Often grown as a hedge but more for ornamental than defensive purposes; will commence to flower when only 2–3 feet high and flowers almost throughout the year in many areas. As a hedge it has the advantage of being evergreen but soon becomes straggling if left unpruned. Even in the subtropics (*e.g.*, S. Rhodesia), plants may flower in two years from sowing seed. The plant is very free from pests. It does not transplant well and is best sown *in situ.* In the dry tropics a good mixed hedge may be obtained by planting alternately with Jerusalem Thorn (*Parkinsonia aculeata*).

Polyscias

P. filicifolia L. H. Bailey (*Aralia filicifolia* Moore, *Panax filicifolium* Hort.). Pacific Islands. A handsome erect shrub 6–8 feet high, often cultivated for ornament in the tropics and sometimes as a hedge or screen or boundary plant. It exhibits much variation in foliage.

P. fruticosa Harms. (*Panax fruticosum* L., *Aralia Guilfoylei* Cogn. et Marsch.). A decorative shrub reaching 7–9 feet, and much cultivated in warm climates on account of its ornamental deeply-cut foliage which may be various shades of green or variegated. It is easily grown from cuttings and being of rapid growth is sometimes used as a hedge plant.



Poncirus trifoliata Raf.

Poncirus

P. trifoliata Raf. (*Aegle sepiaria* DC., *Citrus trifoliata* L.). China and Japan. Trifoliate or Deciduous Orange. A spiny shrub reaching 20 feet, cultivated for ornament in both temperate and warm countries, deciduous in the former and evergreen in the latter. It stands pruning well and may be trained to form a sturdy, if not highly ornamental, defensive hedge from 3 to 10 feet. It is often grown as a hedge in southern Europe (especially the Riviera) and the United States—as far north as Philadelphia (Wyman). For a close-clipped hedge the shrub has the disadvantage of having large leaves, also the foliage is often scanty. The plant suffers from scale insects in some areas. The straight spines are from 1 to 2½ inches long, flattened and sharply pointed. It is usually propagated from seed, sometimes cuttings.

Prosopis

P. juliflora DC. Central Am. Mesquite or Algaroba. This well-known shrub or small tree has been recommended by the Madras

Agricultural Dept. for use as a live fence, the seedlings being of fairly rapid growth and provided with sharp thorns. It has been successfully introduced to many countries as a source of fuel or fodder (edible pods) for dry areas.

Prunus

P. cerasifera Ehrh. W. Asia, Caucasus. Cherry Plum, Myrobalan. A small tree, well known in gardens and as a grafting stock, which forms a useful fence in some countries with a minimum of trouble and attention (New Zealand Journ. Agric. **23,** 285). Formidable spines develop, especially on the old growth, the degree of spinosity varying a good deal. It is quick-growing and easily trimmed with a slasher, producing numerous strong upright shoots on being cut back, which should not be done until a good root system has developed. Under favourable conditions it becomes quite cattle-proof, especially if grown in a double row. It is adaptable to various soil and climatic conditions and strikes readily from cuttings, usually spaced about 1½ feet apart. It forms a good shelter for stock. The yellow or red fruits may be used for bottling.

Punica

P. granatum L. E. Europe and W. Asia. Pomegranate. This well-known small tree thrives in most of the drier parts of the tropics and subtropics and is often grown as an ornamental or as a barrier hedge in these areas. It is naturalised in many countries and numerous varieties are in cultivation, differing in habit, thorniness, flower-colour and fruit characters. In the Orient it is a popular ornamental plant with its shiny foliage and handsome flowers and fruits. The plant stands trimming well but the fact that it is deciduous where seasons are marked lessens its value as a hedge plant. It may be propagated from seeds or cuttings. Young plants do not always transplant readily and are liable to be attacked by termites. At one time it was not infrequently planted as a rough boundary hedge in the midlands of Natal.

Pyracantha

P. angustifolia C. K. Schneider. W. China. This spreading evergreen shrub, with leafy thorns like the other species, has been found useful as a coarse hedge in Southern Rhodesia where it is called " hawthorn." It bears orange-yellow fruits.

P. coccinea Roemer. S. Europe, Asia Minor. Pyracantha or Firethorn. A commonly cultivated garden plant or evergreen wall shrub naturalised in parts of the United States. The variety *Lalandii* Dipp., which is more vigorous and erect, with larger fruits, is perhaps to be preferred as a hedge plant. Used as a hedge in southern U.S.A. (Wyman) and in Rhodesia, where rainfall exceeds 30 inches.

P. crenulata Roemer. Himalayas. Nepalese White Thorn. A slow-growing species closely allied to *P. coccinea* but with smaller flowers and fruits ; said to make a good border or low hedge in Southern Rhodesia (Rhod. Agric. Jour. **37,** 763, 1940).

Rosa

Roses are not infrequently used as hedge plants in the subtropics or at higher altitudes in the tropics and are of value both for ornament and as barriers or screens. Those with a strong-growing erect habit are naturally preferred as hedges, but the vigorous scrambling kinds are often quite suitable given some sort of support in the early stages and the necessary attention. All are likely to be eaten back where goats abound. The following are among the species used as hedge plants in warm climates, most of which exist in various garden forms and hybrids.

Rosa bracteata Wendl.

R. bracteata Wendl. China. Macartney Rose. Produces an abundance of strong straggling stems armed with hooked prickles and scattered bristly ones ; usually evergreen. It grows rapidly, temporary support being preferable when young, and it soon develops into a wide impassable barrier. In Southern Rhodesia it becomes cattle-proof in the second season under favourable conditions (Henkel) ; it is also favoured in Egypt and the southern United States. It may be clipped to a neat garden hedge and bears large white flowers 3–4 inches across.

R. centifolia L. E. Europe. Cabbage Rose. Of erect shrubby growth and one of the oldest of garden roses. Along with the Damask rose (*R. damascena* Mill.) is grown in eastern and southern Europe in hedge form for Otto of Rose.

R. indica L. China. Chinese or Monthly Rose. Various garden varieties of this rose—noted for their long flowering periods—are suitable for hedging. Well reported on as a hedge in South Australia, not becoming a nuisance or spreading by suckers or seeds (Jour. Agric. and Ind. S. Austr. **3**, 1021 ; 1900).

R. laevigata Michaux. China. Cherokee Rose. A vigorous climber long naturalised in the southern United States, also round about Cape Town where it has been used as a dividing screen in large gardens. It has large white single flowers, 4–5 inches across, and small leaves.

R. multiflora Thb. China and Japan. Japanese Rose. A wide-spreading bush of vigorous growth reaching 10–15 feet in height with long arching stems from the base. Suitable as an informal hedge in a large garden where there is plenty of room for development (Wyman).

R. setigera Michaux. N. America. Prairie Rose. Occurs in the southern United States as well as further north ; is unsuited as a clipped hedge but forms a barrier of 4–5 feet if allowed free development (Wyman).

Scutia

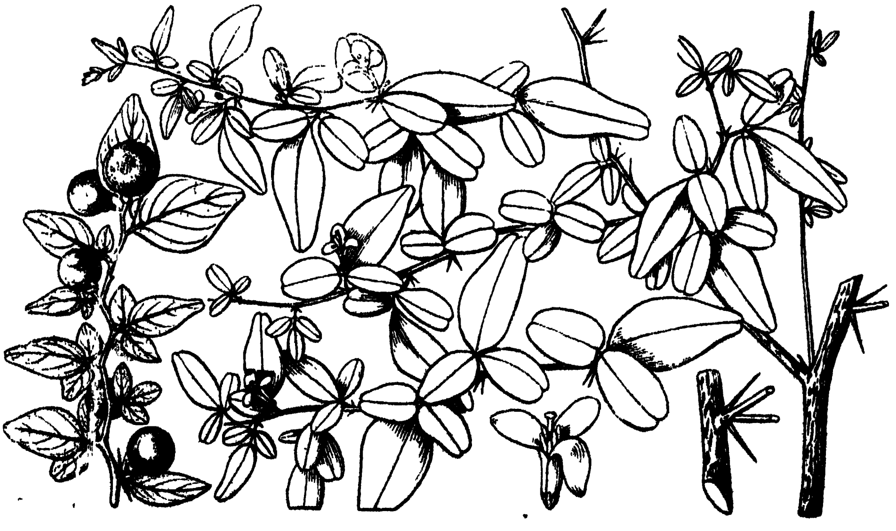
S. myrtina (Burm.) Kurz. (*Rhamnus circumcissa* L.). India. A straggling glabrous shrub armed with small sharp, curved thorns and bearing leathery leaves and yellowish-green flowers ; occurs in the drier parts of Ceylon and western Peninsular India ; said to form a good hedge plant with its numerous diverging branches and to be adapted for field enclosure (Cleghorn).

Solanum

Some of the large woody or tree-like Solanums that are well armed have been used as barrier plants, especially in southern Africa, where they are sometimes to be seen round native kraals and cattle enclosures and are commonly known as " kaffir thorn " or " kaffir apple." Though effective as quick-growing barriers, even becoming cattle-proof in the second season under favourable conditions, they have many drawbacks. They are straggling and inclined to spread or become thin at the base with age. Wounds from them may be " poisoned " or slow to heal. If planted on a bank with a trench on either side they are more easily kept in check. According to MacOwan the " kaffir apple " was often used as a hedge about Grahamstown in the sixties of last century (Agric. Jour. Cape of Good Hope **10,** 428), but has now given way to less ugly and more desirable plants.

Toddalia

T. asiatica (L.) Lamarck (*T. aculeata* Pers.). Tropics, Asia. A large scrambling shrub common in India (up to 5,000 feet), Ceylon, Mauritius, China, the Philippines, etc. Sharp recurved thorns densely cover the branches and are present also on the petioles, making the whole plant exceedingly prickly. Woody conical tubercles develop on the main stems



Triphasia trifolia P. Wils.

and these are terminated by short curved spines. It bears inconspicuous yellowish-green flowers and aromatic orange-coloured fruits which may be pickled. The plant has been suggested as a likely one for defensive hedges (Cleghorn).

Triphasia

T. trifolia P. Wils. (*T. trifoliata* DC.). Myrtle Lime, Chinese Lime. A much-cultivated and popular hedge plant throughout the tropics, growing well in both the wet and dry tropics and under shade. It is an evergreen shrub armed with two short but sharp spines at the point of attachment of the petiole, and bears large fragrant white flowers about an inch across and dull red fruits (½ inch in diameter) which may be used for preserves. The plant is a slow grower but eventually forms a stiff impenetrable hedge and stands pruning well. It is regarded as one of the best all-purpose hedge plants and one of the most handsome in the West Indies. It is tolerant to salt in the soil but liable to some of the diseases or pests that attack Citrus (*e.g.*, Citrus canker). Propagation is usually by seeds.

Ulex

U. europaeus L. W. and Central Europe. Common Gorse. This well-known shrub is sometimes used as a barrier but in spite of its spiny nature has very definite shortcomings. It is very prone to die off here and there leaving gaps, is always of slow growth, and is inflammable in dry weather owing to the large number of dried twigs that remain in the inside of the bush. It has become naturalised in various countries, including Ceylon (at Nuwara Eliya), the middle Atlantic States in the U.S.A., and parts of southern Australia and New Zealand, where it is often a pest. Among early settlers in New Zealand it was freely used as a live fence and shelter for stock (and still is in South Island), especially in dry light land and exposed situations. In East Africa it grows well at 8,000 -9,000 feet (Jex-Blake).

Ximenia

X. americana L. Tropics. Wild Olive. A straggling shrub widely distributed in the tropics of both hemispheres, often in dry stony ground near the sea coast ; occurs also in the subtropics, *e.g.*, South Africa. It is usually well armed with short straight spines and bears an acid olive-like fruit with a seed containing an edible oily kernel. The plant is easily raised from seed and has been suggested as a hedge plant, being not unattractive in foliage and flower (Dalziel).

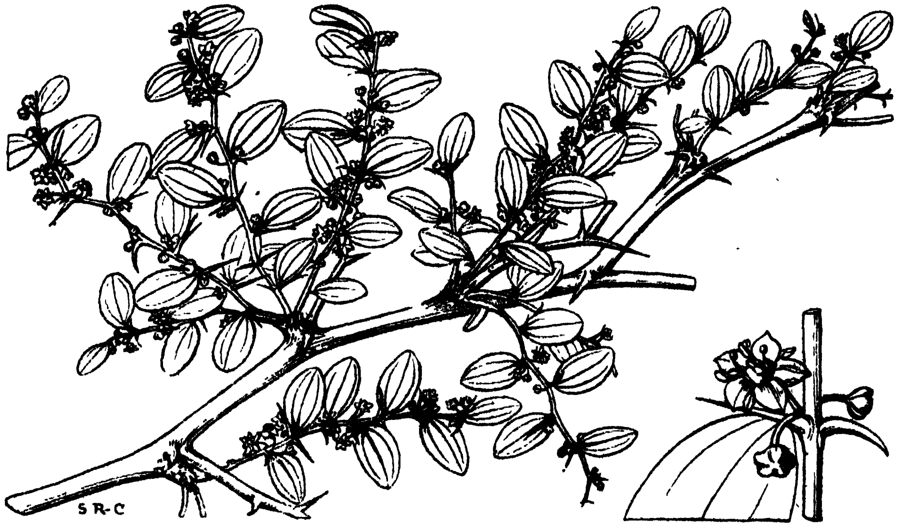
Yucca

Yuccas are sometimes used as boundary or rough fence plants, the majority possessing spine-tipped leaves. Several species are in general cultivation throughout the warmer parts of the world, although all are indigenous to central America or southern North America. Some appear to thrive in both warm and temperate regions. They are well suited to dry areas and light soils. *Y. gloriosa* L. is sometimes seen in hedges in India, being naturalised in parts of the Madras Presidency and on the lower slopes of the Himalayas.

Zizyphus

This genus of small trees or scrambling shrubs, found throughout the warmer parts of the world, contains several species used for live fences. Most are armed with stipular spines which are either equal or one straight and the other curved. Several yield fleshy drupes which are eaten. The foliage is much used as fodder for livestock in some instances, and the prickly dried branches may be piled or lashed together to form stock enclosures. The plants are commonly found in the drier parts of the tropics.

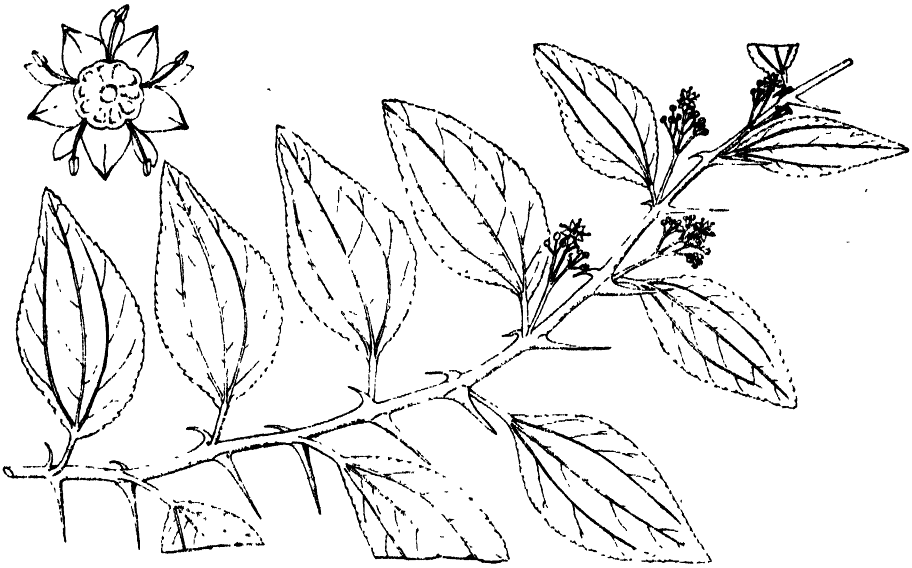
Z. Jujuba Lam. Old World tropics and subtropics. Jujube, Chinese Date. A small tree with drooping branches much cultivated for its fruit, especially in China and India, where many different varieties exist ; also wild over a wide area ; not so well suited to the humid parts of the tropics with heavy rainfall. The tree coppices well and on account of its thorny nature is often used for hedges and the cut branches for constructing barricades. The spines are usually unequal, one recurved and the other straight. Spineless races of the plant exist. The plant has become naturalised in many parts of the West Indies. Propagated by seed, root cuttings or else grafted (for fruit). An objection that has been raised against this species as a live fence is that it forms underground suckers that will invade adjoining fields. It is eaten by livestock (Bond).



Zizyphus Lotus Lam.

Z. Lotus Lam. Lotus. Common in the Mediterranean region and a much-used hedge plant in some parts of Spain ; also used in Cyprus.

Z. mucronata Willd. Trop. and subtrop. Africa. Buffalo Thorn. A shrub widely distributed throughout the warmer parts of Africa. It has been used for hedges at the Cape, although said not to stand trimming well (Holland) ; does best on deep alluvial soils and when well established forms a dense impenetrable barrier that would " stop the rush of any animal except perhaps the elephant." (Rept. Grahamstown Bot. Gdn. 1886).



Zizyphus mucronata Willd.

Z. nummularia W. et A. India. Lotus. This prickly shrub occurs in dry regions in western and north-western India, its fruit being eaten in times of scarcity. It has unequal spines and often covers large areas with irregular thorny masses of scrub. It is deciduous and the leaves are much used as fodder ; often planted as a hedge in India and the dry thorny branches used for fence plants.

Z. Oenoplia Mill. Old World tropics. A scrambling shrub with short sharp prickles ; often grown as a hedge plant in Peninsular India and used for making temporary hedges round paddy fields in Ceylon. It has a wide range from tropical Africa through India to Australia, being usually found in the dry zones.

Z. vulgaris Lamk. (*Z. sativa* Gaertn.). S. Europe and S. E. Asia. A small shrub in the Mediterranean region with rigid spreading branches, occurring wild and cultivated. Fruits similar to those of *S. Jujuba,* best eaten when dried. The shrub may be used as a fence plant.

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BAYONIA DUGAND

Bayonia *Dugand*, a superfluous generic name.—In Rec. Trav. Bot. Néerl. **34,** 211–212 (1937), in a discussion of the heterogeneous elements of the genus *Adenocalymma* (*Bignoniaceae*), I pointed out the existence of a very distinct group of species which was likely to represent a good new genus. The characteristics of these plants, viz. *A. helicocalyx* Kze., *A. fissum* Loes., *A. Seleri* Loes. and *A. micradenium* Standl., with a distribution ranging from southern Mexico to Venezuela, Trinidad and British Guiana, were the trifid tendril, the peculiar calyx which is rugose-warty in age and possesses more or less spirally twisted longitudinal ribs ending in subulate teeth, the pink corolla, and the tuberculate-echinate capsule.

Three years later, in his account of the *Bignoniaceae* of the Maya Area (Carnegie Institution of Washington Publ. No. 522, p. 429 (1940)), Mr. R. J. Seibert left these plants, with similar hesitation, in *Adenocalymma*, but carried their elucidation a step further by uniting *A. fissum* and *A. Seleri* under the former name, and by pointing out that *A. fissum* (of Mexico and Central America) could apparently be distinguished specifically from *A. helicocalyx* (of north-western South America and Trinidad) on the grounds of the shorter and more numerous tubercles of the capsules, which are very irregular in outline.

Then, in 1942, in Contr. Univ. Michigan Herb. No. 7, pp. 52–53, Mr. C. L. Lundell took the plunge and provided the generic name *Onohualcoa*, with a description, for the Central American species alone. Unfortunately, in uniting *A. fissum* and *A. Seleri*—described in the same publication by Loesener—as Mr. Seibert had done, he deliberately rejected the latter's choice of *fissum* in favour of *Seleri*, making the new combination *Onohualcoa Seleri* (Loes.) Lundell and remarking : “although *A. Seleri* and *A. fissum* were described in the same publication, the former has priority of position, and therefore must be accepted as the valid name for the species." This, of course, was in contravention of Article 56 of the International Rules of Botanical Nomenclature. Mr. Seibert's choice of epithet holds, and the name of the species in *Onohualcoa* becomes **Onohualcoa fissa** (*Loes.*) *Sandwith*, comb. nov.

Recently, in a paper of notes on Colombian plants (Caldasia, iv, 62–65 (1946)), Dr. A. Dugand, evidently in ignorance of Mr. Lundell's paper, has given a new and elaborate account of this genus under the new name *Bayonia* Dugand, adopting as the type species *B. helicocalyx* (Kze.) Dugand (Syn. *Adenocalymma micradenium* Standl. of Colombia), which Mr. Lundell had omitted to include in *Onohualcoa*, and accepting Seibert's definition of the second, Central American species under the new combination *B. fissa* (Loes.) Dugand. Dr. Dugand outlines the characters by which *Bayonia* may be distinguished from *Adenocalymma*, *Pseudocalymma*, *Chodanthus* and *Petastoma* : he might also have contrasted *Mansoa*, with a somewhat similar inflorescence but a smooth elongate-linear capsule ; and *Clytostoma*, with its characteristic pseudostipules and inflorescence, more or less tetragonous branchlets, and simple tendril.

It is clear from the above that Dr. Dugand's name *Bayonia* is unfortunately superfluous, while the time has now come for placing the plant of South America and Trinidad in *Onohualcoa* as **Onohualcoa helicocalyx** (*Kze.*) *Sandwith*, comb. nov., a name which will take precedence over *O. fissa*, should the two species be united.

N. Y. SANDWITH.

CYMBOSEPALUM BAKER

Cymbosepalum Baroni *Bak.* in Kew Bull. 1895, 103 (1895) ; Harms in Engl. et Prantl, Nat. Pflanzenfam. Nachtr. **1,** 193 (1897) ; Palacky, Cat. Pl. Madag. **4,** 20 (1906) ; Thonn. Blütenpfl. Afr. 271 (1908) et Fl. Pl. Afr. 253 (1915) ; Lemée, Dict. Descr. Syn. Gen. Pl. Phan. **2,** 454 (1930).

Since the genus *Cymbosepalum* was described by J. G. Baker in 1895, it has remained monotypic. It was founded on a single gathering of a tree collected by Baron in North Madagascar. The type specimen, *Baron* 6422, which is in the Herbarium of the Royal Botanic Gardens, Kew, is devoid of any field-notes, and no actual locality is given by the collector. It consists of a well-preserved shoot in flower, and is undoubtedly referable to **Haematoxylon campechianum** *L.*, a Mexican tree which is very commonly planted throughout the tropics, and which is liable to become naturalised. *Haematoxylon campechianum* L. is already represented in the Kew Herbarium by a sheet from Madagascar, which was likewise collected by Baron (No. 2756), and which bears the correct name in Baker's own handwriting.

E. MILNE-REDHEAD.

FOUR NEW SPECIES OF MEMECYLON FROM EAST TROPICAL AFRICA.

J. P. M. Brenan.

While working on the *Melastomataceae* of East Africa, I have found it desirable to describe the four following novelties in the genus *Memecylon*—two from Tanganyika Territory and two from Kenya Colony. Three of them have remarkably small leaves for this genus and of these one apparently has the smallest leaves of any known African *Memecylon.* Although the genus is well represented in East Africa, it is worthy of note that most of the species in this area appear to have a decidedly restricted distribution ; thus of the fifteen species known from Tanganyika Territory (including those described here), only two—*M. flavovirens* Baker and *M. cyanocarpum* Gilg, which are probably not specifically distinct—occur in more than a single province each. There can be little doubt that further exploration, especially in the montane rain forests of the territory, will reveal more undescribed species of this genus.

I must take this opportunity of thanking sincerely the keepers of the herbaria at the Royal Botanic Gardens, Kew, and at the British Museum for the privilege of examining material of this genus under their care.

I must also thank Mr. J. S. Shaw for making the drawings of the following species.

Memecylon mouririifolium *Brenan*, sp. nov. ; *M. Schliebenii* Markgr. affine, foliis magis ovatis hinc basi latioribus basi ipso late rotundatis vel levissime cordatis nec plerumque subauriculato-cordatis, nervis lateralibus e basi ipso nec paulo supra basim ortis magis arcuatis nec subrectis, venulis majoribus supra prominulis nec anguste canaliculato-impressiusculis, inflorescentiis vulgo lateralibus, pedunculis plerumque longioribus gracilioribusque, praesertim floribus 1–3 centralibus cymae tantum bibracteolatis lateralibus ebracteolatis nec omnibus bracteolis pluribus oppositis imbricatis basi instructis, stylo longiore differt.

Frutex valde ramosus, usque ad 4·5 m. altus, glaber, sempervirens. *Rami* circiter 1–5 mm. diametro, cortice pallide griseo vel griseo ruguloso obtecti ; ramuli graciles, 0·5–1 mm. diametro, obtuse tetragoni, nodis incrassatis, internodiis 0·6–3·5 cm. longis, juveniles siccitate brunneo-purpurei, vetustiores griseo-purpurei. *Folia* ovata usque late ovata, chartacea vel subcoriacea, apice sensim atque obtuse subacuminata vel angustata, basi late rotundata vel etiam levissime cordata, trinervia, magnitudine admodum variabilia, 1·2–5 cm. longa, 0·6–2·7 (—3·5) cm. lata, supra nitida siccitate brunneo-purpurea usque olivacea, subtus opaca pallidiora, margine plano haud revoluto, costa supra impressa subtus prominenti, jugo basali nervorum arcuato et sursum curvato a margine circiter 1·5–5 (—7) mm. percurrente inter nervos transversales utrinque circiter 6–10 curvato et illis satis obviis haud validiore, nervis basalibus supra leviter impressis vel nonnumquam utrinque prominulis, nervis transversalibus et venulis utrinque prominulis supra inconspicuis subtus colore plus minusve purpurascenti facilibus notatu ; petiolus 1–2·5 mm. longus, supra sulcatus. *Cymae* e nodis ramulorum exorientes, aliquando terminales, plerumque solitariae vel nonnumquam geminatae,

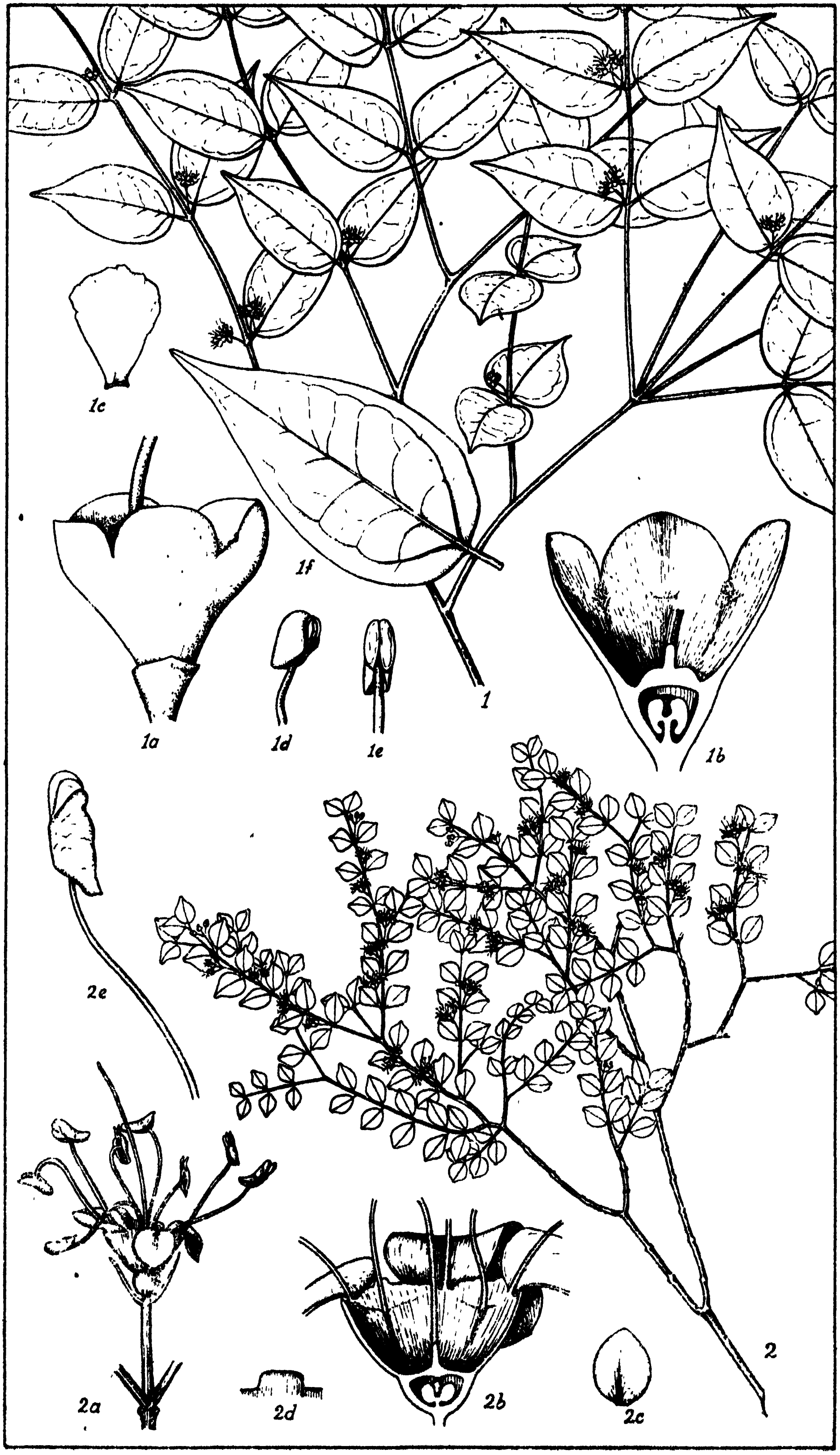

FIG. I

breviter (1–6 mm.) pedunculatae, 3–5-florae ; bracteae apice pedunculi insertae, 1–1·5 mm. longae, ovatae, concavae, acutae, rarius foliaceae, tum 2–4 mm. longae. *Flores* " albi vel pallide lutei," sessiles vel subsessiles. *Receptaculum* late obconicum, medio vix constrictum, 2 mm. altum, apice 2·25–2·5 mm. diametro, in floribus 1–3 mediis cymae basi bracteolis duabus late ovatis circiter 0·9 mm. longis captum, in floribus lateralibus ebracteolatum. *Calycis segmenti* subsemiorbiculares, apice late rotundati, 0·75 mm. alti, 1·25–1·5 mm. lati. *Petala* obovata, 1·7–2·5 mm. longa, 1·25–1·6 mm. lata, apice late rotundata, inferne in basim obscure unguiculatam sensim angustata, margine minutissime atque irregulariter eroso-denticulato. *Staminum filamenta* circiter 2–3·75 mm. longa ; antherae circiter 1 1·25 mm. longae. *Stylus* circiter 3·5–5·5 mm. longus. *Ovula* 5–6, albida, 0·4 mm. longa. *Fructus* ovoideus, 7 mm. longus, 6 mm. crassus.

KENYA COLONY. Arabuko, without date, *R. M. Graham* 1991* (typus in Herb. Kew., Herb. Imp. For. Inst., Oxford) :—shrub to 3·6 m., flowers white ; undergrowth in *Brachystegia* forest : vernacular name (Kisanya) " Mukurcha." Arabuko, 46 m., 1928, *R. M. Graham* 1527 (Herb. Kew., Herb. Imp. For. Inst., Oxford) :—shrub up to 4·5 m., forming undergrowth in *Brachylaena* forests of coast district ; flowers white or pale yellow : vernacular name " Mkata-kimo."

Clearly this species is a close ally of *M. Schliebenii*, but readily distinguishable by the characters mentioned. As Markgraf, in describing the last-named species, pointed out, *M. microphyllum* Gilg and *M. Heinsenii* Gilg also appear to have affinities with *M. Schliebenii*. I have been unable to see material of either, but from the descriptions *M microphyllum* is abundantly distinct from *M. mouririifolium* by its tiny leaves and sessile flowers, and *M. Heinsenii* differs in the winged branchlets, longer petioles, larger leaves narrowed at base, sessile flowers and shape of calyx segments and petals.

Memecylon deminutum *Brenan*, sp. nov. ; species ob folia minima distinctissima, tantum cum *M. myrtilloide* Markgr. comparanda, foliis vix coriaceis minoribus rhomboideis apice obtusis nec subacutis marginibus planis vel vix recurvis necnon cymis pedunculatis plerumque plurifloris facile distinguenda.

Frutex ramosissimus, usque ad 4·5 m. altus, glaber, sempervirens. *Rami* 1·5–3·5 mm. diametro, flexuosi, cortice griseo-brunneo tenuiter et longitudinaliter sulcato obtecti ; ramuli numerosissimi atque gracillimi, intricati, castanei, acute tetragoni, circiter 0·5–4·5 cm. longi, 0·5–1 mm. diametro, vetustiores nodosi ; internodia brevia, 4–8 mm. longa. *Folia* pro genere minima, 0·5–1 cm. longa, 0·4–0·85 cm. lata, late rhomboideo-obovata vel -elliptica, rigide chartacea vel subcoriacea, apice obtusa, basi plerumque cuneata nonnunquam rotundata, supra opaca sub lente rugulosa siccitate atroviridia, subtus opaca pallidiora, margine plano vel vix recurvo, costa supra leviter impressa subtus ad basim versus prominula, nervis venisque aliis ubique occultis ; petiolus brevissimus, 0·5–1·5 mm. longus. *Cymae* vulgo ex axillis foliorum persistentium, nonnunquam ex iis foliorum delapsorum in ramulis vetustioribus ortae, solitariae vel rarissime geminatae, pedunculatae,

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* The number B.470 also appears on the typescript label of this collection.

2–5-florae, raro uniflorae (tum floribus aliis delapsis?); pedunculi filiformes, 3·5–5·5 mm. longi, apice bracteis minimis caducis 0·5–0·8 mm. longis; pedicelli 1–2 mm. longi, apice bracteolis geminatis circiter 0·8 mm. longis instructi. *Flores* albi. *Receptaculum* plus minusve obconicum, 1·25–1·5 mm. altum, apice 1·75 mm. diametro, medio leviter constrictum. *Calycis segmenti* minimi, hyalini, 0·2 mm. alti, 0·25 mm. lati, truncato-obtusi, appendiculos in marginem partis superioris receptaculi impositos simulantes. *Petala* ovato-suborbicularia, 1·4 mm. longa, 1–1·25 mm. lata, apice rotundata, basi vix unguiculata. *Staminum filamenta* circiter 2 mm. longa; antherae circiter 1·25–1·5 mm. longae, 0·6 mm. latae. *Stylus* 4 mm. longus, filiformis. *Ovula* 5, albida. *Fructus* deest.

TANGANYIKA TERRITORY. Mtonto, S. Pare Mts., 1980 m., 4 July 1942, *P. J. Greenway* 6530 (typus in Herb. Kew., Herb. Imp. For. Inst., Oxford):—a much branched evergreen shrub up to 4·5 m. tall with spreading branches and umbels of minute white flowers; locally dominant with 6527, *Grumilea, Psychotria* undergrowth in the dense shade of *Ocotea, Podocarpus, Rapanea* evergreen forest on steep mountain slopes. Shume Magamba camphor forest, W. Usambaras, Aug. 1934, *C. J. W. Pitt-Schenkel* 379 (Herb. Imp. For. Inst., Oxford):—shrub 1·2–1·8 m.; in camphor—*Podocarpus*—*Lasianthus* and other associations.

This outstandingly distinct species has been known for some years only by a single scrappy gathering from the Usambaras, enough indeed to show its distinctness but not to serve as the type of a new species; this deficiency has now been remedied by the fine material recently collected by Mr. P. J. Greenway in the S. Pare Mts. *M. deminutum* is characterised above all by its diminutive leaves of distinctive shape; in size they appear to be the smallest of any African species of the genus. The intricate, slender branchlets, the tiny leaves closely and neatly arranged so that there is scarcely any overlapping, and the inflorescences of small white flowers borne on filiform peduncles conspire to produce an effect of singular delicacy and grace, reminiscent, perhaps, more of some miniature *Cotoneaster* rather than a *Melastomatacea* and making this species recognisable at a glance.

Memecylon verruculosum *Brenan*, sp. nov.; species foliis parvis basi uninerviis apice longe acuminatis, floribus solitariis rarissime geminatis statim distinguenda; a *M. myrtilloide* Markgr. foliorum forma, a *M. natalensi* Markgr. praeterea inflorescentiis unifloris differt.

Frutex usque ad 3 m. altus, valde ramosus, glaber, sempervirens. *Rami* lignosi, 1·5–3·5 mm. diametro, cortice rimuloso griseo vel griseobrunneo obtecti; ramuli novelli intricati, glabri, gracillimi, tetragoni, siccitate brunnei, 1·5–7 cm. longi, 0·3–1 mm. diametro, nodis nonnunquam paria organorum bracteoliformium subulatorum 1–1·5 mm. longorum edentibus nec foliiferis; internodia 1·5–1·8 cm. longa. *Folia* ovato-lanceolata usque ovata, rigide chartacea vel subcoriacea, apice sensim longe et acute acuminata, basi cuneata vel in foliis majoribus rotundata, 2–3·8 cm. longa, 0·8–2 cm. lata, in nodis inferioribus ramulorum saepe reducta, supra sub lente subtiliter ruguloso-muriculata haud nitentia vel tantum nitidula siccitate obscure viridia usque brunnea, costa impressa, nervis aliis occultis hinc ut videtur uninervia,

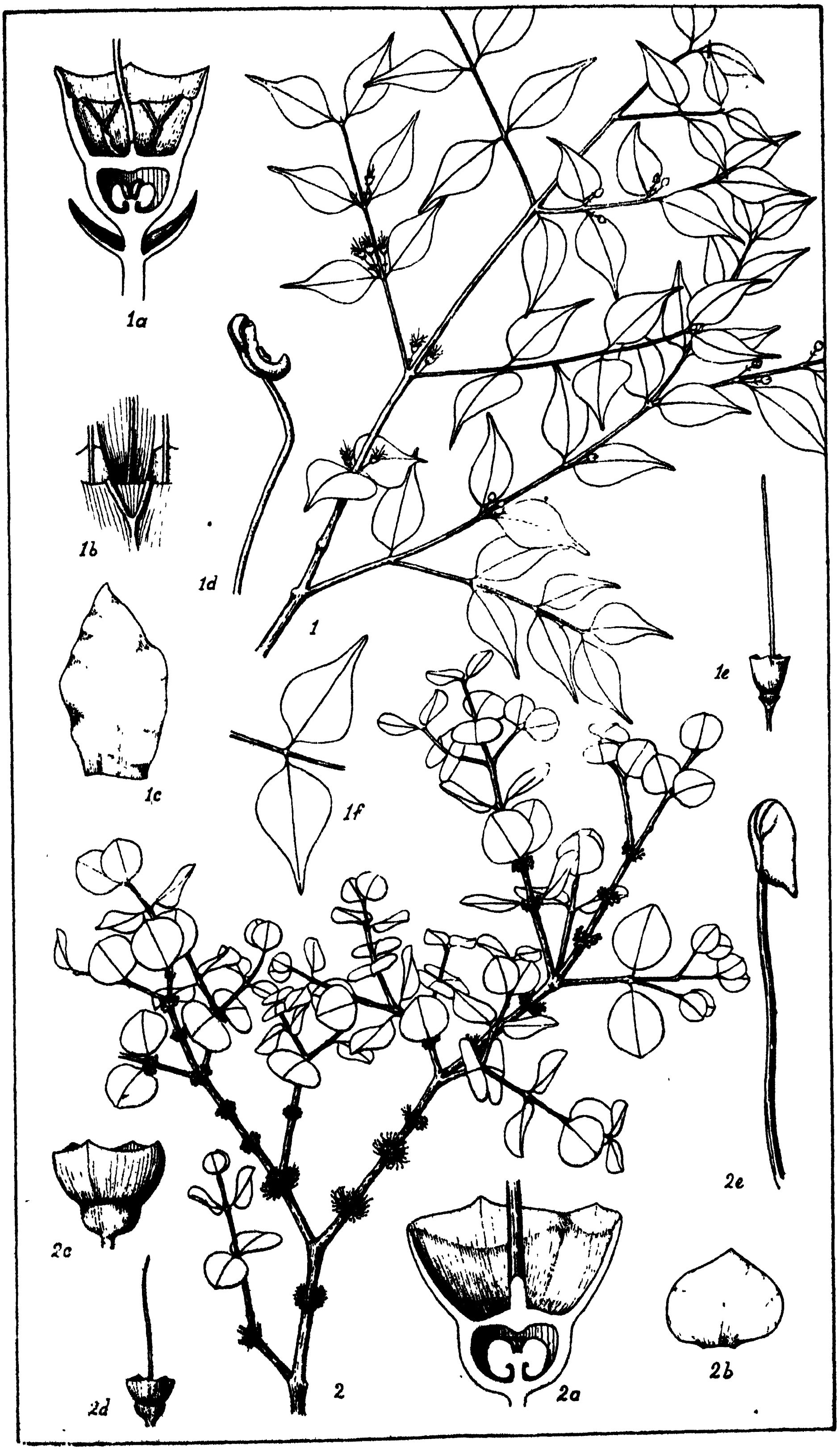

FIG. II

subtus similia siccitate olivaceo-brunnea, costa prominente ; petiolus vix distinctus, nullus vel usque ad 1·5 mm. longus, supra canaliculatus. *Flores* axillares, solitarii vel rarissime ex una axilla geminatim orientes, albi, pedicellati, pedicellis gracilibus 5·5–9 mm. longis ; par bracteolarum inferiorum 0·5–4 mm. supra basim pedicelli insertum, bracteolae superiores 1–1·5 mm. longae, apice pedicelli positae, receptaculi basim plus minusve amplectentes. *Alabastra* rhomboidea, 3–3·5 mm. longa, 1·5–2 mm. lata, apice subacuta. *Receptaculum* obconicum, glabrum, 2 mm. altum, apice circiter 1·5–2 mm. diametro, extra siccitate verruculis minutis plus minusve prominentibus praesertim ad basim versus insigniter sub lente valido notatum. *Calycis segmenti* latissime triangulares, apice apiculati, circiter 0·5 mm. alti, 1·5 mm. lati. *Petala* elliptica, 3·5 mm. longa, 2 mm. lata, apice suboblique acuta, basi vix unguiculata. *Staminum filamenta* 4 mm. longa ; antherae curvatae, circiter 1·25 mm. longae. *Stylus* filiformis, 7·75 mm. longus. *Ovula* 8, straminea, 0·5 mm. longa, 0·25 mm. lata.

KENYA COLONY. Under shrub in coast forests, British E. Africa, 24 June 1909, *E. Battiscombe* 167 (Herb. Kew.). Shrub forming large part of undergrowth in Shimba Hills high forest, 366 m., 1927, *H. M. Gardner* 1447 (Herb. Kew.) :—flowers white : vernacular name (Swa.) " Mkatakimu." Makadara, 335 m., Aug. 1929, *R. M. Graham* 2040* (typus in Herb. Kew., Herb. Mus. Brit., Herb. Imp. For. Inst., Oxford) :—undergrowth in forest ; shrub to 3 m. ; flowers white ; branchlets grow horizontally with flowers pendent : vernacular name (Swa.) " Mkata Kimo."

The rather small but conspicuously acuminate, one-nerved leaves and the flowers normally arising singly from each axil are the main characters of this striking species. The epithet refers to the curious appearance of the receptacle ; under a strong hand-lens or the lower power of a microscope very numerous minute whitish dots are to be seen, mixed with a few, much larger, scattered, pale, wart-like protuberances ; these have been observed on all the sheets of this species, though the larger warts may be sometimes inconspicuous. This appearance seems to be a character of the species and gives a curious, pale-greyish colour to the receptacles in the dry state.

The term " pedicel " in the above description has, to save any possible confusion, been made equivalent to the lateral flower-bearing axes from the base of the receptacle to the insertion in the axil. These axes are invariably simple and one-flowered, but it seems probable that they are in fact reduced cymes in which only the terminal flower is developed. On this interpretation the " bracteolae superiores " are true bracteoles or

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* The number C.571 also appears on the typescript label of this specimen. The system under which two different numbers are given on the label of one and the same collection appears to be rife among specimens sent from various departmental herbaria, at least in Africa, and is both unnecessary and objectionable. One of the numbers is presumably the collector's serial number and the other the number of the specimen in the herbarium concerned. Were this system consistently followed, it would merely add gratuitous difficulty to the labour of citing specimens, but not infrequently one or the other of the numbers is omitted and even when both are given there is often no obvious clue indicating which is which ! Serious confusion and errors may thus easily occur. To number the specimens in a herbarium independently of the collector's numbers may perhaps be desirable or necessary for *internal* use in that herbarium, but on the labels of duplicates issued thence only one number should ever appear and that preferably the collector's own serial number.

prophylls and the " bracteolae inferiores " are bracts subtending the suppressed lateral branches of a dichasium ; the axis below the " bracteolae inferiores " would be the peduncle, while above them it would be a pedicel. Thus " pedicel " in the above description must be taken to mean pedicel + ? peduncle.

From the description of *M. uniflorum* Exell, a species from the Portuguese Congo, an affinity with *M. verruculosum* might be suspected, although the two could clearly not be the same. I have not seen the type (*Gossweiler* 8142) of *M. uniflorum*, but have examined *Gossweiler* 7018 which was cited as being conspecific. This specimen shows that the leaves are trinerved at the base and not uninerved, as stated by the describer ; the basal lateral nerves are, however, very fine and inconspicuous, although prominulous on both surfaces, and they follow the margin at a distance of only about 1–2 mm., looping with the transverse lateral nerves which are also somewhat raised, especially beneath. Other differences from *M. verruculosum* are the shorter acumen of the leaves, the shorter pedicels, the blue not white flowers, the suborbicular petals and the shorter stamen filaments and styles. I do not consider that there is any close relationship between *M. uniflorum* and *M. verruculosum*.

Memecylon Greenwayi *Brenan*, sp. nov. ; ob folia parva late ovata vel suorbicularia basi uninervia cymulasque aggregatas inter species africanas generis perinsigne.

Arbor valde ramosa, usque ad 12 m. alta, glabra, sempervirens. *Rami* 2–4·5 mm. diametro, subteretes, nodosi, cortice siccitate brunneo subtiliter atque crebre longitudinaliter rimuloso obtecti ; ramuli juveniles graciles, atropurpurei, tetragoni, subalati, nitiduli, circiter 1·5–3 cm. longi, 0·75–1·5 mm. diametro ; internodia 0·6–2 cm. longa. *Folia* late ovata usque suborbicularia, rigide coriacea, apice late obtusa vel rotundata saepe leviter emarginata haud acuminata, basi rotundata vel latissime cuneata deinde in petiolum breviter decurrentia, 0·9–2 cm. longa, 0·9–1·9 cm. lata, supra opaca vix nitidula sordide viridia, subtus opaca pallidiora, margine cartilagineo plano vel vix recurvo, costa tantum obvia supra impressa subtus facile cernenda sed ad basim laminae tantum versus prominula, nervis lateralibus occultis vel in pagina superiore foliorum vetustiorum canaliculis angustissimis valde inconspicuis notatis ; petiolus brevissimus, circiter 1·5–2·5 mm. longus. *Inflorescentiae* e cymulis subumbelliformibus paucifloris (floribus circiter 2–4 pro cymula) sessilibus vel breviter pedunculatis siccitate plus minusve violaceo-tinctis compositae, pedunculis 0–2 mm. longis apice bracteis 1–1·5 mm. longis, pedicellis circiter 2·5–3·5 mm. longis bracteolis basalibus ; cymulae in foliorum axillis complures aggregatae etiam numerose glomeratae in pulvinis lignosis e ramulis vetustioribus et ramis defoliatis exorientibus. *Flores* pallide rubelli, paene albi. *Receptaculum* 1·7–2 mm. altum, medio constrictum, parte inferiore subhemispherica, 0·75 mm. alta, 2 mm. lata, parte superiore late campanulata 1–1·25 mm. alta, apice 2–2·25 mm. diametro. *Calycis segmenti* latissime triangulares, apice acuti, circiter 0·6 mm. alti, 1·5 mm. lati. *Petala* late ovata, 1·75 mm. longa, 2 mm. lata, apice subacuta, basi haud unguiculata. *Staminum filamenta* circiter 3·75 mm. longa ; antherae circiter 1·25 mm. longae. *Stylus* 5 mm. longus. *Ovula* 9, pallida, 0·5 mm. longa, 0·3 mm. lata. *Fructus* deest.

TANGANYIKA TERRITORY. Mlinga Peak, E. Usambaras, 1100 m., 28 Aug. 1942, *P. J. Greenway* 6632 (typus in Herb. Kew., Herb. Imp. For. Inst., Oxford) :—a much branched evergreen tree up to 12 m. tall with a bushy rounded crown and clusters of very small, pale pink, almost white flowers in the leaf axils and on the older branches ; locally dominant with *Podocarpus*, *Pandanus* and *Elaeodendron* on the steep slopes of a rocky mountain peak. Same locality, 24 July 1932, *P. J. Greenway* 2999 (Herb. Kew.) :—a much branched tree up to 9 m. tall with a rounded evergreen crown, growing in a mixed *Podocarpus* forest stand on a steep, rocky mountain slope ; very common in this locality only.

On account of the small, one-nerved leaves there are but few African species with which *M. Greenwayi* might be confused. *M. myrtilloides* Markgr. and *M. deminutum* Brenan have yet smaller leaves of different shape, and the young branchlets of the former species are less prominently angled ; in addition both differ widely from *M. Greenwayi* in the inflorescence, *M. myrtilloides* having solitary, axillary flowers and *M. deminutum* having cymes on longer peduncles and solitary or very rarely paired in the axils. *M. verruculosum* Brenan is quite distinct in its larger acuminate leaves and in having the cymes only one-flowered and solitary or very occasionally two together. *M. microphyllum* Gilg, known to me only from the description and the figure in Engler, Pflanzenw. Afr. **1**, 312, t. 279 F.-M. (1910) (repeated in *op. cit.* **3**. ii, 767, t. 321 : 1921), would appear to be separable at a glance by the smaller, acutely acuminate leaves, 7-nerved at the base, and by the sessile flowers.

FIG. I

1. *Memecylon mouririifolium* Brenan, habit, × ½. a, receptacle and calyx, × 12. b, receptacle, calyx and ovary cut longitudinally, × 14. c, petal, × 8. d, e, two views of anther, × 9. f, lower surface of leaf, × 1.

2. *Memecylon deminutum* Brenan, habit, × ½. a, flower, × 7. b. flower cut longitudinally (stamens cut short), × 14. c, petal, × 8. d, calyx-tooth, × approx. 20. e, anther and part of filament, × 16.

FIG. II

1. *Memecylon verruculosum* Brenan, habit, × ½. a, receptacle, calyx and ovary cut longitudinally, × 12. b, insertion of petal and stamen filaments, magnified. c, petal, × 8. d, stamen, × 9. e, flower (petals and stamens removed), × 4. f, pair of leaves, × ½.

2. *Memecylon Greenwayi* Brenan, habit × ½. a, receptacle, calyx and ovary cut longitudinally, × 12. b, petal, × 8. c, receptacle and calyx, × 6. d, flower (petals and stamens removed), × 4. e, stamen, × 11.

RESEARCHES ON SILENE MARITIMA AND S. VULGARIS : XXVI*.

E. M. MARSDEN-JONES AND W. B. TURRILL.

INLAND POPULATIONS OF S. MARITIMA IN THE BRITISH ISLES.

In the third paper of this series (K.B. 1929, 145–175) we described individuals and populations of *Silene maritima* from coastal districts of southern England. *S. maritima* is restricted to N.W. Europe (records from the Mediterranean Basin and elsewhere are all based on incorrect determinations, or refer to casual introductions), and within this range it is generally restricted to the coast, occurring especially on shingle beaches and cliffs. There are exceptions to this generalization. In Iceland one of us has seen it as a common plant in open communities 50 to 70 km. from the nearest point of the coast, as, for example, in the neighbourhood of Langs Joküll. In Jersey it extends inland at least 1½ miles along Waterworks Valley on banks and granitic cliffs. The populations dealt with in this paper are, however, in two rather different categories. Those in Yorkshire and Kerry are definitely isolated from coastal populations, are relatively small in numbers, and have compact areas. The Welsh population, which was sampled at various places, is more or less continuous from the coast along river valleys deep into the hills. Our special purposes in examining these populations were to ascertain if they throw any light on the history of the species in the British Isles and on the relationships and evolution of the group of bladder campions as a whole.

1. **Red Scar,** near Downholme, North Yorkshire, 965 feet.

Silene maritima is recorded from this locality in Baker : North Yorkshire, 115, 208 (London, 1863), with the information that it was originally found here by Mr. Ward. This is " Mr. James Ward, of Richmond," many of whose new " notices " for North Yorkshire were published in Watson's New Botanist Guide, **1** (1835).

According to the geological maps consulted, Red Scar consists of Yoredale Beds with Millstone Grit above. The whole of the Swale Dale, near Red Scar, was apparently glaciated at the period of maximum glaciation, although isolated patches of country to the north-west and south-west of Reeth were believed to have remained ice free. At the " Hessle," or last glaciation, Swale Dale had a long narrow tongue of ice in it, but the high land both north and south, and including Red Scar, was ice-free. Red Scar must then have been above the ice of Swale Dale but looking down on it.

One of us visited Red Scar on 3 September, 1932, climbing up from the Richmond-Reeth road. The lower part of the steep hill slope was very muddy and clothed with dense closed vegetation. Above this was limestone scree of sharp-edged and angled stones and boulders. Finally, there was the cliff face (the " Scar ") of limestone, in places vertical and much weathered. Dark green *Taxus baccata* bushes and small trees were very conspicuous on the cliff face. Other vegetation was sparse and open, consisting chiefly of *Sedum acre* (a large-flowered variant),

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* Continued from K.B. 1940, 73.

Veronica sp., and *Silene maritima*. The *Silene* plants were fairly numerous, but not extremely abundant or dominant. They were scattered and occurred chiefly in clefts on the limestone cliffs, very few being found on the scree.

In September most of the *Silene* plants were in fruit. Four flowering specimens were collected. These were all typical *S. maritima* in habit and other specific characters. They were uniform for : glabrous in all parts, 3-flowered inflorescences, subinflated calyces, white petals, bilobing of petals, divergence of petals, no anthocyanin blotch, purple anthers, white filaments, hermaphrodite flowers, and intermediate *maritima* capsule shape. They showed differences in degree of anthocyanin developed in the vegetative parts and in the calyx, in the depth of petal lobing, in overlapping of petal segments, and in mature testa surfaces.

Six families were grown from seed, collected on Red Scar, in the Herbarium Experimental Ground, Kew. The seeds were sown in March 1933 and the plants scored 22–25 June, 1934. The scorings for every one of the 102 plants was done separately under family and individual numbers and the scoring sheets are filed at Kew with sample specimens. As the 102 plants were grown from wild seed they can be considered equivalent to a sample of the wild population, at least for all the characters which mainly concern our investigations, but only a summation of the characters is given here. A few plants were not scorable for all characters, including 9 not scorable for flower characters.

The general habit of all plants was relatively uniform, all of *S. maritima* type, fairly compact with ascending branches, and all with barren stems. Stem length 1·0–4·6 dm. Anthocyanin in vegetative parts : 1 none, 95 little, 6 medium. All plants were glabrous. Leaves 2·0–4·8 cm. long, 0·3–0·7 cm. broad (all long, 64 broad, 38 narrow). Inflorescences : 36 with 3 flowers, 25 with 5, 32 with 7. Flowers erect and actinomorphic, except in 2 with slightly zygomorphic flowers. Anthocyanin in calyx : 1 none, 25 little, 67 medium. Calyx shape : 9 inflated, 77 subinflated, 7 narrow. Petals : 1·0–2·0 cm. long, 0·4–1·0 cm. broad (all short and all narrow) ; all white ; 1 multilobed, rest bilobed ; 2 with ½, rest with 2/3 lobing ; two with " poor petals " ; 2 scale, 44 small scale, 47 boss ; all with no anthocyanin blotch ; petals overlap or contiguous 57, not overlap or contiguous 36 ; segments overlap or contiguous 85, not overlap or contiguous 8. Anthers all with anthocyanin. Filaments 34 with anthocyanin, 57 white. Female only 2, female and hermaphrodite 9, rest hermaphrodite. Stigmata : 10 purple, 83 white. Immature seeds all pink. Capsules all of *S. maritima* type, i.e. with reflexed teeth, 5 broadly ovoid, 17 obloid, 72 intermediate. Seeds : 91 tubercled, 5 armadillo.

There is no doubt that this is a *Silene maritima* population as shown by habit, barren stems, complete absence of indumentum, number of flowers per inflorescence, actinomorphic flowers, purple immature seeds, and reflexed teeth of capsule. There is some indication of infiltration of *S. vulgaris* genes in the poor development of coronal scales, in all except 2 plants, and, in 2 plants only, a slight trace of zygomorphy. That all the leaves are long is probably partly due to cultivation. The characters of the petals being all short and narrow, having 2/3 lobing (except 2) and no anthocyanin blotch are probably due to the isolation of the population.

The rarity of multilobing of the petals and of female plants is also characteristic. It is noteworthy that two plants had " poor " petals, and one with petals approximating to this condition (see K.B. 1933, 357). Armadillo seeds are always recessive to tubercled, but the proportions vary greatly in wild populations. One plant had strongly tubercled seeds.

2. **Ross Island,** Killarney, Kerry.

On 20 August, 1936, one of us found a population of *Silene maritima* growing near an old copper mine on Ross Island, Lake of Killarney. The population was an isolated one with numerous plants growing scattered in open formation amongst the angular stones. A packet of seeds was collected from a wide range of plants. These seeds were sown in the Herbarium Experimental Ground, Kew, in March 1937, and 59 plants were scored on 1–3 June 1938, as one family under individual numbers.

Scully, Flora of County Kerry, 38 (1916), notes that *S. maritima* was recorded as abundant on the shores of Lake Killarney in 1866, and that it is " Still locally abundant about the Lower and Middle Lakes, as on the Castlelough ruins and adjacent shore, along nearly the whole of the south shore of Ross Island, especially about the old Mines, on rocks and old mine debris on the Middle Lake shore near the Colleen Bawn rock, 1914." At a higher altitude inland it is also recorded " at 1,400 feet above Auger Lake in the Gap of Dunloe." Scully further states : " The Killarney localities for *S. maritima* are almost the only ones known in Ireland where this plant occurs inland at low level and apart from tidal influence. It is associated on Ross Island with abundance of *Armeria maritima.*"

The general habit of the plants was relatively uniform and all had barren stems and were of typical *S. maritima* type. Stem length 0·9–4·1 dm. Anthocyanin in vegetative parts : 5 little, 48 medium, 6 much. All plants were glabrous. Leaves 2·2–4·3 cm. long, 0·3–0·8 cm. broad (all long, 31 broad, 28 narrow). Inflorescence : 1 with 1 flower, 3 with 3 flowers, 23 with 5 flowers, 32 with 7 flowers. Flowers all erect and actinomorphic. Anthocyanin in calyx : 4 little, 46 medium, 9 much. Calyx shape : 13 inflated, 39 subinflated, 7 narrow. Petals : 1·6–2·2 cm. long, 0·6–1·3 cm. broad (all short, all narrow) ; all white ; 10 multilobed, 49 bilobed ; 58 with 2/3, 1 with 3/4 lobing ; 22 scale, 30 small scale, 7 boss ; 14 with anthocyanin blotch, 45 without ; petals overlap or contiguous 56, not overlap or contiguous 3 ; segments overlap or contiguous 55, not overlap or contiguous 4. All anthers with anthocyanin. Filaments 53 with anthocyanin, 5 white. Female only 1, female and hermaphrodite 1, hermaphrodite only 57. Stigmata : 18 purple, 41 white. Immature seeds all pink. Capsules all of *S. maritima* type, 8 broadly ovoid, 19 obloid, 32 intermediate. Seeds all tubercled.

Again, this is clearly a population of *S. maritima* plants. The only suggestion of infiltration of *S. vulgaris* genes is in the coronal character of 7 plants with boss and 30 with small scale, though these exceptions may well be of mutational origin within pure *S. maritima* stock. There is a greater development of anthocyanin than in the Red Scar plants. The occurrence of 10 plants with multilobed petals is noteworthy. That only 1 female plant was present again suggests that coastal conditions favour gynodioecism in *S. maritima.* That all plants had tubercled seeds indicates that the stock from which the population originated had this dominant character and that no armadillo mutations have occurred since the isolation of the population. Two characters are worth comment, though each was shown by only one plant. One individual (No. 27) had toothed leaves, while most plants had no teeth, though a small number had a few teeth or cilia scattered here and there on the leaf-margins. In No. 42 the petals were fused at the base for 3 mm. This character has not been previously observed in any of the *Silene* plants with which we have worked. It may have some significance in view of phylogenetic hypotheses which derive some gamopetalous families from the *Caryophyllaceae.*

3. Cardiganshire.

In July 1930 the *Silene* populations in the Aberystwyth district were examined and sampled from the coast up into the hills to the east, especially along the courses of the rivers Ystwyth and Rheidol. *S. maritima* is common along the coast both to the north and south of Aberystwyth. Most of the common variants were found near the sea. Multilobed petals were common, particularly near the mouth of the Ystwyth. On the other hand, no very narrow-leaved lax plants with much anthocyanin were found, and no plants with white immature seeds, and no yellow-green plants absolutely lacking anthocyanin. The species occurs on Constitution Hill amongst grass, rocks and scree, and plants occur at intervals along the cliff tops on the way to Borth and again on the shingle at Borth. They were not found on the Dovey sand-dunes or salt-marshes, or in the heath vegetation of the hill slopes beyond the cliff margins. They are abundant along the lower course of the Rheidol, on the river gravel and scree. None was found at Ponterwyd Bridge, but they occurred again in the neighbourhood of Devil's Bridge, above the station at about 700 feet altitude. *Silene maritima* occurs on the shingle and banks of the R. Ystwyth from the mouth inland, with practically no breaks, at least as far as just beyond Pont-rhyd-y-groes Bridge at 433 ft. altitude, 12 miles in a direct line from the sea and about 15 miles along the valley from the mouth of the river. Just west of the village is a very deep steep-sided gorge and here no plants of *S. maritima* were seen. They reappeared again beyond this and were also abundant on old mining scree in the village at 550 ft. altitude. Many of the plants here had poor scales or even bosses, some had white seeds, and one had slightly zygomorphic flowers. Plants were seen as far up as near Hafod Church on shingle and grassy banks. None was seen on the Plynlimmon range, where the acid, boggy and peaty terrain, mostly covered with moor and bog vegetation, is obviously unsuitable for them. (See also Salter, Flowering Plants and Ferns of Cardiganshire, 19 : 1935.)

Detailed scorings were made of 56 plants collected along the river valleys of the Rheidol and Ystwyth, 9 of them after cultivation at Kew for a year. These scorings are summated as follows :

The general habit of all plants was that of *S. maritima* with the exception of three whose characters showed they were hybrids with *S. vulgaris.* Stem length 1·8–6·0 dm. Anthocyanin in vegetative parts : 3 none, 22 little, 24 medium, 7 much. All plants were glabrous. Leaves 1·5–4·3 cm. long (45 long, 11 short), 0·2–1·1 cm. broad (10 broad, 46 narrow), or excluding hybrids 0·2–0·6 cm. broad (8 broad, 45 narrow). Inflorescences : 1 with one flower, 1 with 2 flowers, 38 with 3, 3 with 4, 3 with 5, 9 with 7, 1 (hybrid) with 11. Flowers erect and actinomorphic, except in the hybrids. Anthocyanin in calyx : 9 little, 33 medium, 14 much. Calyx shape : 24 inflated, 19 subinflated, 13 narrow. Petals : 1·2–2·6 cm. long (23 long, 33 short), 0·3–1·2 cm. broad (all narrow) ; all white ; 9 multilobed, 47 bilobed ; 3 with ½, 3 with 2/3, 50 with 3/4 lobing ; 3 with " poor petals " ; 29 scale, 21 small scale, 6 boss ; 15 with anthocyanin blotch, 41 without ; petals overlap or contiguous 33, not overlap or contiguous 23 ; segments overlap or contiguous 26, not overlap or contiguous 30. Anthers all with anthocyanin, except one yellow-green. Filaments 39 with anthocyanin, 5 white. Female only 12, female and hermaphrodite 3, hermaphrodite only 41. Stigmata 10 purple, 45 white. Immature seed colour 52 pink, 2 white. Capsules all of *S. maritima* type, except in hybrids, 7 broadly ovoid, 9 obloid, 24 intermediate. Seeds 14 tubercled, 30 armadillo.

This population was not only the largest of those investigated for this paper but it was also the most varied. In addition to the characters mentioned, three plants in the sample had ciliolate leaves, one of them with very narrow curved leaves, two had very narrow petal segments, and one had long cylindrical calyces. This last plant (No. 2044) was very different from any others in the population. The long calyx prevented the proper development of the petals which, with the stigmata, were scarcely longer than the calyx. The flowers were all without properly developed stamens and no capsules or seeds set. Under cultivation at Potterne for four years the plant remained sterile, though it flourished and flowered well for several years. A description of it is given in K.B. 1939, 303. It exemplifies that some mutations are harmful unless accompanied by other mutations affecting some other organs, or unless the one mutation also affects these organs in such a manner as to bring all the organs again into harmony with one another. The elongated calyx prevents the proper functioning of petals and stigmata, which were not increased in size. The ½ lobing of the petals also appears here to be connected with the delayed growth of the petal lamina through retained enclosure in the long calyx. Had mutation also increased growth of corolla and gynoecium a giant-flowered plant would have resulted whose flowers might have been functional at least on the ovule side.

A small family of 6 plants was grown at Kew from seed from Carnarvonshire (v. c. 49), near Bettws-y-Coed, 175 ft., 29 Sept. 1935, collected by A. Wilson, sown March 1936, scored 24 June, 1937 [See B.E.C. 1934 Report, 961 (1935)]. The plants had ordinary *S. maritima* habit with barren stems. Stem length 2·8–3·3 dm. All with medium anthocyanin in vegetative parts and calyx. All glabrous. Leaves 3·4–3·7 cm. long (all long) ; 0·4–0·5 cm. broad. Flowers 3 to 6 per inflorescence, all erect and actinomorphic. Calyx all subinflated. Petals : 17–20 cm. long, 0·8–1·2 cm. broad ; all white ; all bilobed with 2/3 lobing ; 2 scale, 4 small scale ; all without anthocyanin blotch ; all with petals overlapping and segments not overlapping or contiguous.

All with purple anthers. Filaments : 4 purple, 2 white. All hermaphrodite. Stigmata : 2 purple, 4 white. All with purple immature seeds. Capsules of *S. maritima* type and of intermediate shape. Seeds : 1 tubercled, 5 armadillo.

No indications of hybridization appear in this sample.

Reference should be made here to the peculiar plant from Pen-y-fan, Brecknock Beacons, South Wales, 870 m. altitude, which was described in K.B. 1937, 45. This plant was investigated genetically and the results were given in the above paper. The foliage and coronal characters showed resemblances to those of *S. vulgaris*.

We have not studied inland populations in Scotland, though such occur, as, for example, on Ben Nevis. At Kew we grew two plants which were collected by C. V. B. Marquand, among scree, on Sgurr Dearg, Skye, 2,500 feet altitude, on 26 July, 1934. These plants were interesting since they resembled in some characters plants from Iceland grown at Kew from seed. They, like Icelandic plants, did not flourish at Kew, one producing no fruits or seeds and the other only a few. They remained very dwarf and had few flowers. The scored characters were the following. Stems 1·0–1·2 dm. long. Much anthocyanin in vegetative parts. Glabrous. Leaves 1·7 × 0·3 and 2·1 × 0·45 cm. Flowers 1–3 per inflorescence. Medium anthocyanin in calyx which was subinflated. Petals 1·6 × 0·9 and 1·8 × 0·8 cm. ; white ; bilobed with 2/3 lobing ; scale ; no anthocyanin blotch ; petals overlapping in one and not in the other ; segments not overlapping. Anthers yellow-green. Filaments white. Hermaphrodite. Stigmata white. Immature seeds purple. One with tubercled seeds and capsule probably of *S. maritima* obloid type.

Records of other inland occurrences of *S. maritima* in the British Isles can be found in literature. It is known from the Mendips (see below), from the north slopes of Llyn Cwellyn, at 477 ft. in North Wales [see Journ. Bot. **30.** 87 (1892)], from Dunsdale ravine, Cheviot [see Nat. Hist. Trans. Northumberland and Durham **2,** 134 (1868)], and from various localities in the Lake District [see Baker, Flora of the English Lake District, 46 (1885)]. We have not examined these populations in the field, but would welcome plants and seeds from them.

DISCUSSION

The inland populations of *Silene maritima* may be expected to throw some light on the relationships between this species and *S. vulgaris* and on the history of both in the British Isles. There is, however, much other evidence helping towards the solution of these problems and a full consideration of them must wait till details of continental inland populations of *S. vulgaris* (*S. cucubalus*) agg. and the results of crossings between these and British stock plants have been published. The following facts and deductions are, however, important.

Silene maritima is taxonomically distinguished from *S. vulgaris* by a series of usually well-defined characters. These include habit, smaller leaves, barren stems, 1–7-flowered inflorescences, larger erect and actinomorphic flowers, coronal scales, and reflexed teeth of capsules which have wider mouths. In addition, hairy varieties are unknown in wild *S. maritima* and populations of this usually have a higher proportion of pink immature seeds and of armadillo testas. There are, however, exceptions, often isolated ones, to all specific differences on one side or the other, or on both. Many of these have been described in this series of papers. It is certain that these " break downs " in character differences are sometimes due to interspecific hybridization, though this may have been remote and now reduced to gene infiltration. In other instances, for example the occurrence of capsule characters approximating to those of *S. maritima* in the Hog's Back population of *S. vulgaris* (K.B. 1931, 133), mutations or unusual gene combinations seem more likely to account for parallelism of the usually specific characters.

S. maritima and *S. vulgaris*, at least in Great Britain, are not maintained as distinct taxonomic entities through inter-sterility. Their chromosome numbers have proved to be the same for all stocks so far investigated ($2n = 24$). We have found no indications of genetical incompatibility in reciprocal crosses between many stock plants of the two species and, in general, the F_1 and subsequent generations are fully fertile, as also are backcrosses. Yet, in the wild, the two species remain distinct. Natural hybrids are rare, though they occur both near the coast and on the hills where the two species meet. Hybrid swarms, comparable to those of the *Centaurea nigra* agg.—*C. jacea* group, have never been seen by us.

In general distribution *S. maritima* has a smaller range than *S. vulgaris* and is recorded from Iceland, Scandinavia, Denmark, British Isles, except extreme north, N. and W. France, N. Spain, and Portugal. *S. vulgaris* occurs over most of Europe, to 70° N. in Scandinavia and up to 2,600 m. altitude in Switzerland, and much of western and central Asia. The latter is, in the broad aggregate sense, the more variable species. The relationships of continental mountain plants often determined as *S. alpina*, *S. glareosa*, etc. are to be considered in a later paper. Here it need only be noted that in low habit, few-flowered inflorescences, and, surprisingly, in capsule characters, some of them simulate *S. maritima*. Rarely they show barren stems, but pink immature and ripe armadillo seeds sometimes predominate. Some plants occurring, especially in south-eastern Europe, near the Mediterranean coast, also show some characters recalling those of *S. maritima*. In these, as in the continental mountain plants, there can be no question of hybridization with true *S. maritima* and what character parallelism there is must be of mutational origin and be maintained by the selective factors of the habitats. The British Isles, probably like southern Scandinavia, is thus a very suitable area for studying the relationships between *S. vulgaris* and *S. maritima* since one or other or both occur over most of the country as distinct populations.

It has become obvious in the course of our studies that *S. vulgaris* and *S. maritima* are maintained as distinct population entities by their occupying different habitats to which they are respectively adapted by the sum-total of their morphological characters and behaviour. *S. maritima* occurs on shingle, scree, cliffs, and rock faces. Its deep roots, low, more or less spreading habit, with barren stems, both chamaephytic and hemicryptophytic in behaviour, small leaves, and dwarf few-flowered inflorescences, enable it to tolerate wind exposure and some degree of mobility of the substratum. It cannot, however, partly at least through the possession of these very characters, compete successfully with other species in more generally favourable situations. It flourishes best in very open communities where the terrain is not saline, water-logged, or markedly acid, but it tolerates a high content of lead, copper, and perhaps other minerals which are harmful to some species. It is much less susceptible to *Marssonina* (see K.B. 1928, 14) than many stocks of *S. vulgaris*, and this disease is favoured by wet conditions of weather and climate. It is noteworthy that stocks of *S. vulgaris* from dry regions, for example parts of the Balkan Peninsula, suffer badly at Potterne and Kew from *Marssonina* except in very dry summers. While this disease does not necessarily kill the plants it greatly reduces their powers of reproduction by preventing proper flowering and fruit formation. It is difficult to explain in terms of natural selection the absence of hairy plants in *S. maritima*, since such are not uncommon in *S. vulgaris*, and in continental high mountain variants, or taxonomic relatives of the latter. The rather more frequent development of anthocyanin in both vegetative and reproductive parts in *S. maritima* possibly has some survival value though the physiological functions of anthocyanin are none too well understood. The open-mouthed capsules with strongly reflexed teeth allow the seeds to escape much more readily in *S. maritima* than they can from the narrow-mouthed capsules with erect teeth of *S. vulgaris*. We have not yet completed our investigations of seed dispersal, seedling establishment, and seedling variations in the two species, but it is worth noting here that in *S. maritima* germination can occur immediately after seed shedding, or may be delayed till the following year or later. Germination sometimes occurs in seeds caught up in the bladdery calyx the radicles penetrating the membranous fruiting calycine tissues. Broken off pieces of infructescence can thus both aid in dispersal and hold up seedlings on loose shingle and scree till the radicles have penetrated the substratum while the green cotyledons and the developing shoots are meantime kept at surface level.

S. vulgaris is found in a greater variety of habitats—in grassland, especially on chalk and limestones in this country, on waysides and banks, in hedgerows, in waste places, as a weed in arable land, and at wood margins and in more open places in woods. A study of its continental habitats suggests that it is naturally a plant of open woods and wood margins, but is it often abundant as a constituent (even a dominant constituent) of mountain meadows which are reaped just as the seeds ripen. Its erect habit of growth, hemicryptophytic behaviour, larger leaves, and tall many-flowered inflorescences enable it to compete successfully with many other herbs even in fairly closed communities. *S. maritima* is adapted for tolerance of habitat conditions generally unfavourable to a majority of plants, while *S. vulgaris* is more adapted for competition with other species in more generally favourable habitats.

The above facts, together with others which have been published in earlier papers of this series, or of which details are to be published later, have led to the following tentative conclusions for our British populations of *Silene vulgaris* and *S. maritima*. Phylogenetically *S. vulgaris* sens. lat. represents the older type from which a number of other entities have been differentiated. One of these is *S. maritima*, which probably originated from the *S. vulgaris* plexus with the on-coming of the colder, wetter, and more severe conditions at the end of the Pliocene which culminated in the Pleistocene glacial period. Its occurrence under existing " cold desert " conditions in Iceland strongly suggests it could have survived the Glacial Periods in this country, a view consistent with its distribution in all coastal areas and in some inland stations. Of the inland populations studied it is probable that the one on the old mining site in Ross Island, Kerry, is of recent introduction in that actual habitat. This, like similar populations in the Mendip Hills, Somerset [see Murray, Flora of Somerset 46 (1896) ; White, Flora of Bristol, 185 (1912) ; and Marshall, A supplement to the Flora of Somerset, 32 (1914)] occurs on the debris of old mine workings. Populations of S. *maritima* were also found on abandoned mining sites in western Wales and it seems that the stony mineral-rich substratum is inimical to many species, but favours *S. maritima*, which forms a very open pioneer community with little or no competition from other plants. The initial stages in the succession on such artificial habitats are probably prolonged. On the other hand, the main population around the Killarney Lakes may be of ancient and even pre-Glacial origin. The Red Scar population may also well represent an inland survival from pre-glacial times, if not actually *in situ*, at least within the Swale Dale area. In this connection the occurrence of *S. maritima* on Moughton Fell Scar, above Wharf, in the West Riding, may be recalled [see Davis & Lees, West Yorkshire, 266 (1878) and Lees, Flora of West Yorkshire, 161 (1888).] These populations occur in natural habitats of loose scree and broken cliffs and in areas where, according to the latest geological information available, there were larger or small areas of terrain which were free of ice during the Glacial Epoch, although not necessarily all free at the same time or for the whole Epoch.

In several ways the Welsh populations of *S. maritima* were the most important of those here recorded. They were by far the largest, in the enormous numbers of individuals present and in area covered, and the most variable morphologically. It was extremely interesting to follow them up the river valleys and to note that here, as on the coast, they occupied only very restricted habitats, river-shingle, river-banks, and, occasionally, old mine-workings, where they were not subjected to close competition with other species. It was difficult to understand that the species could have worked its way up from the coast under the existing conditions. The rivers in spate have a great volume of very swiftly flowing water which moves sand, gravel, and boulders downwards and the only possibility would be that occasional high winds blowing up the valleys could transport upwards pieces of infructescence with seeds still enclosed in the bladdery calyces between these and the capsule. Even this seemed unlikely in places where there were steep ravines and waterfalls, as near Pont-rhyd-groes. The coastal, river-valley, and inland hill populations are in this part of western Wales essentially continuous and this continuity of the populations is certainly old and may well date back to Glacial or pre-Glacial times.

While there is thus good circumstantial evidence that *S. maritima* is, in the British Isles, a survival from Glacial or pre-Glacial times, corresponding evidence suggests strongly that *S. vulgaris* is of post-Glacial introduction. It is absent in parts of northern Scotland and in the British Isles generally is most common, and often quite limited, to areas much influenced by human activities. While it may be native in the south of England, especially on chalk downland, it has been widely spread as a weed of arable land, waysides, and waste and disturbed ground. It rarely occurs in completely natural habitats. It withstands much closer competition than does *S. maritima* (partly through its taller, more erect habit) but is less tolerant of cold, wind-exposure, and wet climatic conditions. The natural range of *S. vulgaris* is to the south and east of the British Isles and it is on the Continent that the greatest variation is found. We conclude that though *S. vulgaris* is a phylogenetically older type than *S. maritima* it is younger as a member of the British flora and migrated after the retreat of the ice, perhaps in part by natural means, but largely through human activities, from continental Europe.

Some comments must be added regarding intraspecific variations in isolated populations of *S. maritima*. In previous papers the occurrence and, for some plants, the genetics, of variations in coastal populations have been fairly fully considered. Variations in such characters as degree of anthocyanin development, calyx shape, petal size, lobing, and overlapping, coronal development, sex, capsule shape, and testa surface are much the same in both coastal and inland populations, though proportions are often different and in small inland populations isolation has sometimes led to greater uniformity in some characters. We have so far studied, within British *S. maritima*, no population which we could define as an ecotype within Turesson's original definition. It is possible that on Brecknock Beacons there is a population which could come under this definition, but we have not seen it *in situ* and have had only a single plant from it for morphological and genetical analysis. None of the other inland populations examined shows special characters—in structure or behaviour—by which it can be recognized as showing a genotypical response to the "locality," the habitat, or to any special environment. The narrow-leaved population at the Portland end of Chesil Beach, with much anthocyanin and narrow-cylindric flowering calyces [see K.B. 1929, 151, 171, and 1938, 248 ; Journ. Ecol. **26,** 364 (1938) and l.c. **33,** 63 (1945)], is the nearest to a morphologically distinct population we have found in the British Isles. It does not, however, in its morphological peculiarities suggest "genotypical response" to particular environmental conditions in any way different from those found farther west on the Chesil Beach. Whether this population is better adapted, perhaps physiologically, to the Chesil Beach conditions and will maintain and even extend its range remains to be seen. The distributional and genetical evidence has led to the conclusion that it is of fairly recent mutational origin, and on the western margin of its present small range it is hybridizing with other plants of *S. maritima*. As shown above, and in other papers of this series, there are many individual variants, within both inland and coastal populations, which are distinguished by peculiar characters and are genetically distinct. *S. maritima* is genetically variable, but transplant experiments show that some stocks at least are less plastic than it was at first expected they would be. Some of the genetic variations (very long cylindric calyx or "poor petal," for example) are disadvantageous and the field evidence is that natural selection acts against them. Probably *S. maritima* is already so highly adapted to the peculiarities of a limited range of habitats that further advantageous mutations are likely to be extremely rare. To adapt the species, or to produce an ecotype of the species, to any markedly different habitat would need the simultaneous (or approximately simultaneous) occurrence of several to many mutations, any one of which would by itself not adapt the plant possessing it to distinct habitat conditions, but would make it less adapted to its present environment, and this apart from the fact that some of the more important characters (as those of habit) which do indicate " genotypical response," as we understand it, are polygenic.

REVIEW

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Plants and Bee-keeping.*—Bee-keepers, who are interested in all the branches of natural history relevant to their craft, have long needed what Dr. Howes has now supplied—a full and botanically accurate account of the plants, wild and cultivated, from which the honey bee in Britain gathers nectar and pollen.

The author, who is both an expert bee-keeper and a professional botanist, begins by considering all aspects of the relations between bees and their food plants, giving much wealth of curious as well as thoroughly useful information on, for example, types of honey, the significance of the bee in pollination, and the planting of bee pastures and bee gardens. Those plants which constitute the important sources of the honey crop are then dealt with at length ; and the final section tells of the many wild and garden flowers which provide small but valuable increments of fodder for the ever-hungry stocks. There are many beautifully reproduced photographic illustrations, and the whole volume is most attractively turned out.

This is one of those books which will quickly assume the comfortably worn appearance produced by much thumbing. It is not only a bee-keeper's book, however ; it contains a great deal of interest to the horticulturist, and the author has so fully developed the fascinating quality of his subject that no lover of flowers or amateur naturalist could resist its charm.

H. A. DADE.

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* By F. N. Howes, D.Sc. Faber & Faber, 1946, pp. 224. 32 plates. Price 12*s*. 6*d*.

ERRATUM

In K.B. 1, 1946, page 3, the date of Dr. Chatterjee's assumption of the duties of Botanist for India should read 15th April, 1946.

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ROYAL GARDENS

KEW.

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Kew Bulletin

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Kew Bulletin

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FORMERLY THE "BULLETIN OF MISCELLANEOUS INFORMATION"

No. 1, 1947

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1946.

It is not yet possible to afford space for a full review of the year's activities at Kew. This report will include only a brief statement of the more important items, but occasion will also be taken to refer to various matters connected with the war years which have not been recorded before.

STAFF. The following changes, additional to those mentioned in K.B.1, 1946, are recorded :-

MR. P. H. B. TALBOT has been appointed Botanist for the Union of South Africa, and took up his duties on 13th November, 1945.

MISS E. A. BRUCE resigned her post on 31st October, 1946, on appointment to the staff of the Division of Botany, Pretoria.

MRS. SPRAGUE (MISS M. L. GREEN) retired on 27th November, 1946.

It is a matter of satisfaction that the work of the Institution and DR. HUTCHINSON'S contributions to taxonomy have been recognised by his election to the Fellowship of the Royal Society.

The Herbarium.

The last of the material evacuated from Kew for safe keeping during the war was brought back early in 1946, and the restoration of the Herbarium to its normal state was a task which took up all the available time of a much-depleted staff for the whole of the year. More than 1,200 standard cabinets, completely filled with specimens, had to be re-erected in addition to those which had been kept in the basement of the Herbarium, and the entire collection had to be re-spaced in the three wings of the building. It is hoped that the work of re-labelling the cabinets will be completed early in 1947, but during the whole period all parts of the Herbarium have been accessible to all persons requiring to make use of them.

Very little mounting has been done during the year, owing to shortage of staff. Some 40,000 sheets have been presented or purchased. Amongst important acquisitions are the Lester-Garland herbarium of approximately 9,000 sheets, and the Dixon collection of British mosses (about 2,600 sheets). 5,261 specimens have been sent out from Kew as exchange or gifts, and 2,288 sheets on loan.

The destruction of the greater part of the Berlin-Dahlem Herbarium resulted in the loss of about 250 sheets of valuable material sent to Berlin on loan before the war.

An unsatisfactory feature is the difficulty and delay which is being experienced in restoring the Herbarium staff to adequate strength, which is resulting in great arrears of naming and accumulations of specimens awaiting mounting and distributing.

Visitors are again making use of the facilities of the Herbarium for study and research, though the number is as yet small in comparison with pre-war years. In particular, valuable research is being done by Dr. N. L. Bor (Indian Grasses), Dr. A. Parsa (Flora of Persia) and Mr. P. R. O. Bally (Flora of Kenya).

Arrangements have been made for a closer liaison between the Herbarium and Garden staffs. Different sections of the Gardens have been allocated, for taxonomic purposes, to members of the Herbarium staff, and the reciprocal advantages of such an arrangement are already evident, although shortage of staff prevents the full implementation of the scheme.

The Library.

Apart from general routine work, the time of the Library staff has been largely taken up with the rehabilitation of the Library after the return of the books evacuated during the war, the provision of extra shelf-room to meet the evergrowing demand for more space, and the endeavour to fill the war-time gaps in collections.

Accessions since the beginning of the war amount to about 850 volumes and 3,500 pamphlets and reprints.

The Gardens.

The rainfall for the year 1946 was over 30 inches, about 6 inches more than the average, and the increase proved very beneficial to the lawns and to trees and shrubs generally. The luxuriant growth of Conifers, especially *Chamaecyparis*, *Thuja* and *Cryptomeria*, was noticeable. By contrast, the rainfall for the four previous years, particularly the winter rainfall, was well below the average. The figures since the last record in the *Bulletin* are :—

1941	29·24 inches
1942	20·87 „
1943	20·39 „
1944	19·26 „
1945	18·64 „
1946	30·83 „

The unmber of visitors in 1946 was 1,567,954, an increase of about 200,000 over 1945, and this despite the inclemency of the weather during the latter part of the year. The attendance figures since the last record in the *Bulletin* are :—

1940	822,928
1941	825,372
1942	1,230,241
1943	1,401,001
1944	911,494
1945	1,364,768
1946	1,567,954

A feature of the spring bedding display was provided by 30,000 Tulip bulbs which formed part of a thank-offering from the people of the Netherlands in recognition of Britain's effort during the war.

During recent years serious losses have occurred among the older trees at Kew, and in 1946 over a dozen large beeches had to be removed owing to their dangerous condition. It is becoming clear that many of the trees forming the original planting of Kew some two hundred years ago have reached their allotted span of life, though in some instances senescence may have been hastened by the recent series of abnormally dry winters. . Other losses in 1946 were the best specimens of the Cricket Bat Willow, *Salix caerulea*, and of *Magnolia acuminata.*

Some large elms on the mound by the Ruined Arch were removed, as they were reaching a dangerous condition, and the opportunity was taken to replant with more colourful subjects.

A very rare occurrence was the flowering of *Elliottia racemosa.*

A clearance has been made of some of the Holm Oaks and Limes alongside the Kew Road Wall, south of the Victoria Gate ; their place is being taken by a large-scale planting of Camellias.

During the last two years a reconstruction of the Iris Garden has been carried out, with marked improvement in its design ; it now contains a good collection of modern varieties, including many new introductions presented by Iris lovers.

In 1944–45 a new Chalk Garden was constructed on the Ice-well mound, west of the Economic Houses, to furnish a much-needed habitat for calcicolous species, which moreover provides the means of cultivating a number of the rarer British plants.

In the Palm House the Cycads have grown during recent years to such an extent that they now require almost the whole of the south wing of the building. Cones were produced in 1946 on *Cycas revoluta, C. circinalis, Encephalartos hildebrandtii* and *Macrozamia spiralis.*

A very important addition to our Australian plants has been made by large collections of seeds specially sent by Captain and Mrs. Neil McEacharn, who travelled widely in Australia in search of material. Many of the seeds were sent to England by air, and we have been successful in raising from these recently harvested seeds many rare and difficult plants. Our special thanks are due to these good friends of Kew who have been instrumental in replacing many species lost through war damage to the Temperate House in 1940–1942, and introducing many others which have seldom or never been in cultivation at Kew before.

During the year a number of Student-gardeners returned from war service to complete their training at Kew, and there was also inaugurated the Government's training scheme for ex-service men, whereby special one-year training courses are given to selected men at Kew, Wisley and certain other institutions. The employment of women gardeners has therefore almost ceased at Kew for the present, although it is intended to resume the employment of women when normal conditions return. It is proper to express here our great debt to the women who took service at Kew during the war. They replaced men in almost every section of the establishment and were efficient in every way. The demonstration allotment was run throughout the war by women staff, and is being continued under Miss I. Sanders, who has been in charge since 1945.

The exchange of plants and seeds with other institutions was naturally much reduced during the war. With the gradual restoration of postal and shipping facilities this activity is again expanding, though it is still far below the pre-war level. In 1946, 473 separate consignments of plants and seeds were received from other institutions, and about 10,000 packets of seeds were sent out, in addition to plants, cuttings, etc.

Twenty-one University Departments and Research Institutes have been furnished with material of some ninety species for purposes of research, apart from supply to individual investigators.

The Museums.

Much time has been spent in the restoration of the spirit specimens, which had been stored away during the war to reduce the fire risk. The collections are now once more in good order, but there have been few new acquisitions during the year. It has not yet been possible to re-open the North Gallery, which suffered considerable damage from a nearby bomb. Displays of selected pictures from Miss North's collection have been made from time to time in Museum 3. Some other special exhibits have also been made here, amongst them being plants of importance to beekeepers, and the potato (1946 marked the centenary of the great potato famine, due to blight, in Ireland).

The Vegetable Drugs Committee of the Ministry of Supply, on which Kew was represented, was dissolved on completion of its work ; the final report of the Committee acknowledged the assistance of Kew in the organisation of the collection of medicinal plants and in the production of a standardised Rose-Hip Syrup. Kew has also co-operated in the preparation of Vegetable Drug monographs for the British Pharmacopoeia, and is to be represented by a member of the Staff on the newly-formed Drugs Requirements Advisory Committee of the Ministry of Health.

The Jodrell Laboratory.

An important activity has been the preparation of a new book on the systematic anatomy of the Dicotyledons (see Kew Bull. 1946, p. 3). This work, which has been carried out in collaboration with Dr. L. Chalk of the Imperial Forestry Institute, Oxford, is now nearing completion. The Assistant Keeper's principal helper at Kew has been Dr. C. L. Hare, who left in October to take up a post in the University of Liverpool.

Many routine identifications of timbers, fibres and other miscellaneous botanical material have been made, and with the steady expansion of the reference collection of microscope slides this work can now be carried out much more quickly. The Assistant Keeper continued to serve on the Pharmacognosy Sub-Committee set up by the Pharmaceutical Society for the revision of the British Pharmaceutical Codex.

Dr. E. K. Janaki, working chiefly with material cultivated in the Gardens, investigated the cytology of many ornamental and economic plants, especially Magnolias, Bamboos and species of *Philadelphus* and *Morus*. Her researches are now being continued at Wisley. Other visitors who worked at the Jodrell during the year included Dr. M. Skalinska (cytology and ecology of *Valeriana*), Dr. R. D. Gibbs of McGill University (types of lignification as revealed by the Marle reaction), Dr. L. Portheim (cultivation of Cacti in water), and Dr. M. Jepps, University of Glasgow.

Economic Botanist.

An important research carried out during the war (see Kew Bull. 1946, p. 3) concerned the raising of potato crops from " eyes " or chips, instead of from the whole " seed ". This work was completed in 1946, and the results confirmed previous findings. The crop from eyes may be reckoned as about 75 per cent of a normal crop. The quality is excellent, and there appears to be a larger proportion of ware than in a crop grown from whole sets.

The world shortage of food has directed attention to the need for intensifying food production in the Colonies, and at the request of the Colonial Office an investigation is being made into the possibility of introducing into parts of East Africa food crops that are grown in certain areas of Peru and Bolivia. Tubers of edible species of *Ullucus* and *Tropaeolum*, and seeds of *Chenopodium* and *Amaranthus*, have been obtained and grown to maturity at Kew for preliminary identification. It is considered unlikely, however, that any of these will be of great value, since both tubers and seeds are small, and it is probable that they are grown in the High Andes chiefly because climatic conditions are unfavourable to crops of higher quality.

Amongst the oil seeds investigated in 1946 was one from Germany called " samens " of which the Germans made great use during the war ; this proved, on cultivation at Kew, to be *Impatiens roylei*. Interest has been shown in a brush-fibre plant, *Agave lechuguilla*. Plants of this species have been raised at Kew from seed obtained from Mexico about eight years ago, and it is hoped to send plants to Kenya for field trials in the spring of 1947.

Sir Geoffrey Evans has assumed the Chairmanship of the Bedgebury Committee and also that of the Colonial Office Committee on Anti-Locust Research.

Bedgebury.

The National Pinetum was fortunate in sustaining no damage from enemy action during the war, although the area around suffered bomb damage during the Battle of Britain and was in the direct line of the Flying Bomb attacks. The war, of course, made it difficult to expand the already representative collection, and shortage of staff and materials rendered maintenance difficult.

Mr. W. Dallimore, to whose care and devotion since 1925 full tribute has been paid by the members of the Pinetum Committee, asked to be relieved of his duties in October, 1945, as his health might preclude regular visits in the future. He was persuaded to continue as a member of the Committee, where his great knowledge of forest species and his experience of local conditions will continue to be of the utmost value. Mr. W. L. Taylor resigned the Chairmanship of the Committee and was succeeded by Sir Geoffrey Evans.

It has been decided that the collections now necessitate the appointment of a whole-time resident officer, who will not only be concerned with the maintenance and future development of the estate but will be in a position to see to the correct labelling of the various species, keep regular observations and notes on the requirements of each, and carry out experiments in natural regeneration, maintenance of soil fertility and similar matters. When this officer, who will be styled Superintendent, has been appointed he will also resume charge of the adjacent Forest Plots which had to be relinquished during the war years. It is proposed that this officer should be a member of the Forestry Commission service and should be seconded for duty under the Pinetum Committee. Until accommodation is available in the neighbourhood it was felt that it would be difficult to attract the right kind of man for the post, but it is hoped that this difficulty will be overcome by the construction of new houses by the Forestry Commission. For the present, as a temporary arrangement, supervision is being carried out by the Chairman of the Committee, who makes as frequent visits as possible, and Mr. Castle, who has served the Pinetum so long and faithfully, has had his status raised and continues as Foreman in charge.

Lord Courthope accepted an invitation to become a member of the Committee, and his great knowledge of all matters connected with forestry will prove of great value.

Publications.

Supplement X of the Index Kewensis (1936–1940) has been passing through the press during 1946, and publication should be effected early in 1947. The compilation of Supplement XI is proceeding.

From 1942 to 1946, while the Kew Bulletin was suspended, publication of research had perforce to be made in other journals. The following is a list of the more important books or papers by members of the staff which have been published during 1946, or which will shortly appear.

W. B. Turrill : The ecotype concept. New Phyt. 45 (1946).

A quantitative study of petal size and shape in *Saxifraga granulata.* Journ. Genetics (in press) (with E. M. Marsden-Jones).

Researches on *Silene maritima* and *S. vulgaris*, XXVI : Inland populations of *S. maritima* in the British Isles. Kew Bull. 1946.

E. M. WAKEFIELD : New and interesting British fungi. Trans. Brit. Mycol. Soc. 29 (1946) (with R. W. G. Dennis).

Edible and poisonous fungi. Bull. 23, Ministry of Agric. and Fisheries, ed. 7 (in press).

C. E. HUBBARD : *Henrardia*, a new genus of the Gramineae. Blumea, Suppl. III (1946).

H. K. A. SHAW : The genus *Allium* in the U.S.S.R. (translation from the Russian). Herbertia, 11 (1946).

Notes on *Gonystylus* (in press).

Typification of names derived from persons or places (in press).

R. W. G. DENNIS : Notes on some British fungi ascribed to *Phoma* and related genera. Trans. Brit. Mycol. Soc. 29 (1946).

B. L. BURTT : *Streptocarpus polackii* sp. nov. Bot. Mag. t. 9688 (with J. R. Sealy).

E. NELMES : Key to the *Carices* of Malaysia and Polynesia. Kew Bull. 1946.

Two critical groups of British sedges, *Carex flava* L. and *C. muricata* L. Bot. Exch. Club 1945 Report (1946).

J. R. SEALY : Botanical Magazine articles tt. 9667, 9670, 9674.

D. CHATTERJEE : A note on a new genus of *Cucurbitaceae*. Nature 158, 345 (1946).

Indian species of *Arisaema*. Nature 158, 490 (1946).

An account of Kew Gardens. Science & Culture, Calcutta (in press).

The influence of the Mediterranean flora on India, l.c. (in press).

New records of plants from India and Burma. Kew Bull. 1946, 49.

J. HUTCHINSON : A Botanist in Southern Africa. Gawthorn, London.

Common Wild Flowers. Penguin Books.

F. N. HOWES : Plants and Beekeeping. Faber, London.

Fence and Barrier Plants. Kew Bull. 1946.

R. MELVILLE : Typification and Variation in the smooth-leaved Elm. Journ. Linn. Soc. Bot. 1946.

Timber Trees and Research at Kew. Official Architect, 1946.

C. R. METCALFE : The Systematic Anatomy of the Vegetative Organs of the Angiosperms. Biological Reviews, 1946.

REVIEW.

Goethe and Morphology.*—The study of the morphology of vascular plants as a subject in its own right, with its own rules and aims, has receded in relative importance to subjects involving experiment or field research. In spite of attempts to increase interest in it by advocating new hypotheses regarding the nature or the history of organs, it may be doubted if it will again dominate either the botanical text-book or the research-worker's outlook. Nevertheless, a wide knowledge of morphology is essential to students in most, if not all, branches of biology, and it is all to the good that something of the history of morphological theory—whether orthodox or heterodox—should be known to every biologist. Dr. Arber's translation of Goethe's " Versuch die Metamorphose der Pflanzen zu erklären," 1790, together with her historical and explanatory essay, form an excellent introduction to the development of morphological theory.

The " Introduction " is, in many ways, a masterpiece of learned writing. That Goethe was a combination of philosopher, poet, and botanist is clearly emphasized in such a sentence as " he treated his theory, of which he was enamoured, as having the finality of a work of art, rather than the provisional character of a work of science," or, again, " it was synthesis to which the whole of his mental and psychical equipment inclined him personally." It is clearly recognized that Goethe's great service to morphology lay in the recognition that its basis must be essentially comparative. Dr. Arber is critical of Troll's recent work in which the *sui generis* nature of root, stem, and leaf, as advocated by Goethe, is still fully accepted. Whether or not the hypothesis of the leaf as " a partial-shoot, which shows an urge towards whole-shoot characters," with a more or less parallel explanation for the root, is a great advance in morphological theory cannot be discussed here (see A. Arber, in Biol. Rev. **16,** 81–105 : 1941). One is left with the impression, though Dr. Arber may not agree with the resultant deductions, that plant morphology is, in the future, likely to be more and more linked with taxonomy, cytogenetics, ecology, and certain branches of physiology in the narrower sense, and less and less likely to be considered a subject contrasted, on its own merits, with any other.

With regard to the new translation of Goethe's " Versuch " one can have nothing but praise. It has been most carefully done and is a great improvement on earlier translations known to the reviewer.

W. B. TURRILL.

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* Goethe's Botany, by A. Arber : Chronica Botanica **10,** No. 2 (1946), 2 dollars.

NOTES ON THE GENUS GONYSTYLUS TEIJSM. ET BINNEND. (THYMELAEACEAE)

H. K. AIRY SHAW

TYPE-SPECIES AND SYNONYMY

The first species of *Gonystylus* to be described as such was *G. miquelianus* Teijsm. et Binnend. in Bot. Zeit. **20**, 265 (1862). At the end of their description, however, these authors added : “ Hic pertinet *Aquilaria ? macrophylla* Miq. et *A. bancana* Miq.” (Miq. Fl. Ind. Bat. Suppl. 355-6 : 1860), and it is therefore clear that the epithet *miquelianus* was a superfluous one. From Teijsmann and Binnendijk's account of their species, it is evident that *Gonystylus* “ *miquelianus* ” was described almost entirely from Javanese material, and fortunately there are in the Kew Herbarium three good sheets of the type collection, as well as very poor ones of the types of Miquel's two species. Comparison of the three leaves no doubt that the Sumatran *A. macrophylla* and the Javanese *G. miquelianus* (s. str.) are conspecific,* whilst *A. bancana* is distinct† ; and in point of fact Teijsmann and Binnendijk, while including Sumatra, the type-locality of *A. macrophylla*, in the distribution of their *G. miquelianus*, omitted from it Banka, the type-locality of *A. bancana*. The following new combination and adjusted synonymy are therefore necessary :—

Gonystylus macrophyllus (*Miq.*) *Airy Shaw*, comb. nov.

Aquilaria ? macrophylla Miq. Fl. Ind. Bat. Suppl. 356 (1860).

Gonystylus miquelianus Teijsm. et Binnend. in Bot. Zeit. **20**, 265 (1862), *nom. illegit.* (*superfl.*) ; Miq. in Ann. Mus. Bot. Lugd.-Bat. **1**, 133, t. iv (1863-4) ; Koord. et Val. Bijdr. No. 9 Kenn. Booms. Java, in Meded. 's Lands Plantent. **61**, 48 (1903).

G. bancanus auctt., quoad pl. Jav. et Sumatr., non (Miq.) Baill.†

SUMATRA (Priaman, *Diepenhorst* [type of *A.? macrophylla* Miq.]) ; JAVA (Tjampea, prov. Bogor, *Ten Cate* [type of *G. miquelianus* T. et B.], and other localities in the lowlands, where it is rare, according to Koorders & Valeton, l.c.).

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* There is in Borneo a closely related species, characterized by its midrib being narrowly elevate above, not channelled, and by its much narrower and more acute sepals, which may be distinguished as follows :—

Gonystylus stenosepalus *Airy Shaw*, sp. nov., ex affinitate *G. macrophylli* (Miq.) A. S., sed ab omnibus speciebus cognitis costa supra anguste prominente nec alte argute impressa distincta ; foliis 12–20 cm. longis 5–9 cm. latis siccitate lutescentibus utrinque sub lente densissime glanduloso-punctatis, sepalis anguste triangularibus 6–7 mm. longis basi 2 mm. tantum latis, petalis circiter 20 pustulatis glabris.

SARAWAK. Rejang River, near Sibu, 1891, *Haviland* 489 (d.g.b.f.): “ Small tree.”

† *G. bancanus* (Miq.) Baill. (s. str.) is, I believe, represented by two specimens in Herb. Kew, from SARAWAK, near Kuching : 28 Feb., 1893, *Haviland & Hose* 3660A and 3660K. The species is characterized by its small leaves (4·5–13 cm. long, 2–5·5 cm. wide), drying a purplish-brown colour beneath, and (if the above *Haviland & Hose* specimens are correctly identified) by its short, almost deltoid sepals, somewhat approaching those of *Amyxa pluricornis* (Radlk.) Domke. Its occurrence in Amboina (cf. Merr. Interpr. Rumph. Herb. Amb. 353 : 1917 ; “ Ceram (*Dakkus*) ”—Domke, 1934, p. 35) seems improbable, though I have seen no Moluccan material of the genus at all. A specimen from S. Dutch New Guinea (van der Sande River, 100 m., 16 Sept., 1912, *Pulle* 390), distributed as *G. bancanus*, probably represents an undescribed species near *G. borneënsis* (Van Tiegh.) Gilg.

SECTIONS OF THE GENUS

G. macrophyllus must be regarded as the type-species both of the genus and of the type-section, which may be diagnosed as follows :—

Gonystylus Sect. **Eugonystylus** *Airy Shaw*, sect. nov. Flores in inflorescentia thyrsoïdea irregulariter nodoso-fasciculati ; ramuli brevissimi, haud elongantes. Petala glabra, raro sparse retrorso-setulosa. Capsula sphaerica vel late ovoïdea, haud vel vix costata.—Typus : *G. macrophyllus* (Miq.) Airy Shaw (i.e. *G. miquelianus* Teijsm. et Binnend., pro maxima parte).

In Hook. Ic. Plant., *tab. ined.*, I have given the diagnosis of a second section, based upon *G. augescens* Ridl. in Kew Bull. **1946,** 43 (1946), which for convenience may be repeated here :—

Gonystylus Sect. **Auxanthus** *Airy Shaw*, sect. nov. Flores secundum ramos inflorescentiae paupere paniculiformis regulariter racemose dispositi ; rami valde elongantes. Petala intus dense retrorso-setulosa. Capsula (? an semper) anguste lanceolata, grosse sexcostata.—Typus (species adhuc unica) : *G. augescens* Ridley ex Airy Shaw.

A third section is required for the remarkable plant described by Domke in Notizbl. Bot. Gart. Berl. **12,** 233 (1934) under the name *Gonystylus sympetala* Van Steenis et Domke. I have, unfortunately, not yet seen material of this interesting species, but the very full description published by Domke leaves no room for doubt as to its isolated position in the genus. The section may be diagnosed as follows :—

Gonystylus Sect. **Aëtoxylon** *Airy Shaw*, sect. nov. Folia opposita vel sub-opposita. Flores in umbellas axillares pedunculatas aggregati. Petala ad annulum humillimum integerrimum glabrum membranaceum redacta. Capsula plus minus globosa, ecostata, vel loculorum abortu elongato-curvata.—Typus (species adhuc unica) : *G. sympetala* Van Steenis et Domke.

The name *Aëtoxylon* refers to the fact, mentioned by Domke, *l.c.*, quoting information supplied by Van Steenis, that aromatic heartwood is formed regularly by *G. sympetala*, instead of only occasionally or irregularly as in the case of most other species. The native name *kayu garu*, applied to several Thymelaeaceous trees yielding a similar heartwood, signifies ‘eagle wood’ ; hence *Aëtoxylon*, from the Greek *ἀετός* eagle, *ξύλον* wood.

TWO NEW SPECIES

G. confusus *Airy Shaw*, sp. nov., cum *G. maingayi* Hook. fil. hucusque confusus, sed differt foliis siccitate sordide nigro-purpurascenti-brunneis vel subplumbeis (hoc noto cum *G. calophyllo* Gilg congruit) nec laete olivaceo-castaneis, utrinque (etiam subtus) distincte lucidulis, textura tenuiore, epidermi superiore sub lente (praeter nervos prominulos) plus minus laevi (interdum sub lente verruculis minutissimis consperso) nec ut in *G. maingayi* dissite impresso-punctato et minute ruguloso (“ chagrin-

ato "), costa subtus glabra vel pilis parcissimis adpressis instructa, floribus paullo maioribus extra paullo magis adpresse et sericeo-tomentellis, fructu ut videtur multo maiore usque 10 cm. diametro (in *G. maingayi* vero vix ultra 3 cm. diametro).

Arbor 15–24 m. alta, trunco usque 60 cm. diametro, ramis pendulis (omnia teste *Kunstler*). *Ramuli* modice graciles, teretes, cortice fusco striato interdum transverse fisso, lenticellis parvis inconspicuis. *Folia* oblanceolato-oblonga vel rarius oblonga, 9–27 cm. longa, 3·5–9 cm. lata, basi cuneata usque rotundata, apice abruptiuscule cuspidata usque breviter acuminata, cuspide vel acumine obtuso, integerrima, angustissime incrassato-marginata, tenuiter vel modice coriacea, siccitate sordide nigro-purpurascenti-brunnea vel subplumbea (inferne magis brunnescentia), utrinque glaberrima nisi subtus pilis paucis adpressis prope costam interdum instructa, sub lente utrinque manifeste vel obscure brunneo- vel fusco-puncticulata et interdum insuper verruculis microscopicis undique conspersa ; costa subtus elevata, supra plana vel vix prominula, basin versus impressa ; nervi laterales numerosi, gracillimi, paralleli, late patuli, prope marginem anastomosantes, in marginem anguste incrassatum demum desinentes, utrinque prominuli ; venulae minores primariis plerumque parallelae, valde reticulatae ; petioli 8–17 mm. longi, 1–3 mm. crassi, plus minus teretes, striati, rugosuli, glabri. *Inflorescentiae* terminales vel hinc inde ut videtur axillares, parce vel vix ramosae, ramis usque 13 cm. longis fasciculos florum dissitos subsessiles vel breviter nodoso-stipitatos gerentibus, subadpresse ochraceo-pubescentes. *Fasciculi* usque 3 mm. longi, pauciflori, dense ochraceo-pubescentes. *Bracteae* alabastris iam minimis caducae, ovatae, dorso carinatae, usque 4 mm. longae et 2–3 mm. latae, subacutae, densissime ochraceo-sericeae. *Pedicelli* graciliusculi, sub anthesi usque 18 mm. longi, densissime fulvo-ochraceo-tomentelli, longitudinaliter striati. *Alabastra* globosa, ante anthesin circiter 5 mm. diametro, basi subintruso-truncata. *Sepala* imbricata (2 exteriora, 2 interiora, 1 intermedium), ovato-deltoïdea, 6–7 mm. longa, 2·5–3·5 mm. lata. *Petala* circiter 30, subulato-filiformia, 3–4 mm. longa, laevia, glabra. *Stamina* circiter 30, filamentis 1 mm. longis, antheris aequilongis. *Ovarium* ovoïdeum, fere 3 mm. longum, sericeum, sulcatum, apice appendicibus vel processubus 3 parvis subglobosis pubescentibus circa styli basin instructum. *Fructus* magnus, subglobosus, 4–10 cm. diametro (teste *Kunstler*), pericarpio lignoso usque 7–8 mm. crasso extra valde ruguloso, endocarpio tenui coriaceo-crustaceo a pericarpio secedente. *Semina* (quum solitaria) subglobosa, usque 3·6 cm. diametro.

PENANG. Government Hill, 360 m., Apr. 1885, *Curtis* 1509 : " Tree 60 ft. high." Ibid., July 1893, *Curtis* 3036. Ibid., Mar. 1915, *Ridley* sine num.

PERAK. Goping, Apr. 1885, *Scortechini* 1937. Tapa, n.d., *Wray* 1252 : " Tree ; calyx green covered with golden brown hairs, petals white, stamens four [sic!], lemon yellow centre." Larut, open old jungle, rocky localities, 150–300 m., Jan. 1883, *King's Collector* 3778 (*typus*, Herb. Kew) : " A tree 50 to 70 ft. high. Stem 1½ to 2 ft. in diameter. **Leaves glossy,** middle green. Fruit 1½ to 2 ins. in diameter, a rusty brown." B[atang] P[adang] D[istrict], dense jungle on low hills, 90–150 m., July 1885, *King's Collector* 7752 : " A tree with hanging branches, 60 to 80 ft. high.

Stem 18 to 24 ins. in diameter. **Leaves glossy,** bright green. Fruit rusty greenish brown, 2 to 4 ins. in diameter."

SELANGOR. Rawang, 1914, *Kloss* sine num. Klang Gates, lowlands, 1 Jan. 1921, *Ridley* sine num. : " Tree, fruits large brown." Ayer Hitam Reserve, 5 Nov. 1925, *Omar & Ja'amat* 10908 (vernacular name *karukaru*).

SINGAPORE. Garden Jungle, 1907, *Ridley* sine num. (probably 6186).

LINGGA ARCHIPELAGO. Prope Singkip, n.d., *Teijsmann* 12075 (distributed as " Dipterocarpea—Seraja ").

This species has been hitherto confused with *Gonystylus maingayi* Hook. fil. It may therefore be useful to cite the specimens of the latter that have been verified :—

PENANG. Government Hill Road, 90 m., 16 July 1918, *Md. Nur* 3784 : " 20–40 ft. high." PERAK. Sine loc. vel dat., *Scortechini* sine num. Larut, open jungle, side of hills, 90–150 m., Dec. 1882, *King's Collector* 3703 : " A tree 50 to 60 ft. high. Stem 10 to 15 ins. in diam. **Leaves rough** in feeling. Fruit grey mottled with dark white [sic !]. The weather was very wet end of December, could not help some of the spec. falling to pieces." Ibid., open jungle on hills, 150–240 m., Apr. 1885, *King's Collector* 7478 : " A fine tree 60 to 80 ft. high. Stem 15 to 20 ins. in diam. Leaves rich green. Flower velvety, pale green, stamens pale cream color." MALACCA. 6 May 1868, *Maingay* 2574 (Kew distrib. 1441) (type) : " Capsule 6 loc., 3 or 4 loculi abortive, seeds solitary in each loculus erect distinctly arillate." NEGRI SEMBILAN. Selaru Reserve, 22 April 1918, *For. Gd. Ludin* 1876 (vern. name *merawan penak*).

SARAWAK. Sine loc., 1865–68, *Beccari* 1209 (type of *G. affinis* Radlk. and *G. beccarianus* Van Tiegh.). BRIT. N. BORNEO. Mt. Kinabalu, on slope, 840 m., 2 Sept. 1931, *Foster & Puasa* 97 in *B.N.B. For. Dept.* 3529 : " Tree 45 ft. high, 21 in. girth " ; vern. names *paliu* (Dusun), *nasi-nasi* (Kedayan).

The difference noted by Kunstler (and emphasized above in thick type) between the glossy leaves of *confusus* and the dull shagreened leaves of *maingayi*, in conjunction with the different colours assumed on drying (a metallic leaden or purplish-grey in *confusus*, a yellowish or greenish brown in *maingayi*), is very marked. The colour of the dried leaves of *G. confusus* is almost exactly the same as that which characterizes *G. calophyllus* Gilg. There appears also to be a difference in the size of the ripe fruit, that of *confusus* apparently reaching a considerably greater size than *maingayi* ; but this requires confirmation in the field, as it seems doubtful whether the fruits present on the herbarium specimens of the latter are really mature. There appears to be no significant difference either in the geographical or in the altitudinal distribution of the two species. As indicated in the diagnosis and in the enumeration of specimens of *maingayi*, the Bornean *G. affinis* Radlk. (*G. beccarianus* Van Tiegh.) is certainly referable to *G. maingayi*.

I have not seen the small-leaved specimens from Brisu (Malacca) and Bukit Timah (Singapore) referred to by Ridley in Journ. Roy. As. Soc.

Str. Br. **35,** 85 (1901), nor are they cited by Gamble in Journ. As. Soc. Beng. **75** (2), 267 (1912) (Mat. Fl. Mal. Penins. No. 23). Gamble seems to have almost stumbled on the clues to the second species, for he notes (l.c.) " considerable variation, to some extent in the leaves, but especially in the size of the fruit," of his " *G. maingayi* " material ; he notes also the fact that the leaves of the type (*Maingay* [K.D.] 1441) are " more reddish-brown and slightly more pubescent beneath than most of the other material."

The late C. F. Symington wrote me in April 1943 (the last communication received before his tragic death) : " There are at least 4, and probably 5, species of *Gonystylus* in the Malay Peninsula . . . I think Ridley had 4 species in his *G. Maingayi*." I have been unable to distinguish more than 2 species in the limited Peninsular material at Kew, but I have no doubt that Symington's statement will be found to be correct when work can be resumed on the Kepong and Singapore material (if still extant), or in the field.

The small blunt processes or humps on the ovary at the base of the style should be compared with the remarkable curved appendages or ' horns ' found in a similar position in *Amyxa pluricornis* (Radlk.) Domke. The morphological nature and use of either are quite obscure. The humps of *Gonystylus* are clearly indicated in Dr. J. Hutchinson's drawing of the ovary in Ridley, Fl. Mal. Penins. **1,** 322, fig. 30 (1923). Domke, in Biblioth. Bot. **27,** Heft 111, 34 (1934) speaks of the " ' Nebengriffel ' unbekannten morphologischen Wertes " of *Amyxa*, " von denen *Gonystylus* keine Spur aufweist " : I believe this to be not quite accurate, and that the two sets of structures are probably homologous, but I am unable to throw any light on their true nature.

It may be noted here that the status of the genus *Gonystylus* as an undoubted member of the *Thymelaeaceae* has recently received confirmation (if indeed such was needed) from Dr. G. Erdtman's investigation of the pollen morphology: see his ' Pollen morphology and plant taxonomy, VII. Notes on various families ' in Svensk Bot. Tidskr. **40** (1), 81–2 (1946). I am convinced that the *Thymelaeaceae* (incl. *Gonystylus*) is an extremely isolated group, possibly related to *Proteaceae*, but having no connection with the *Malvales*, *Parietales* or *Myrtiflorae.*

G. keithii *Airy Shaw*, sp. nov., *G. borneënsi* (Van Tiegh.) Gilg forsan maxime affinis, sed foliis siccitate discoloribus (supra viridibus subtus rubido-purpureo-brunnescentibus, rarius utrinque viridibus) angustissime atro-brunneo-reflexo-marginatis, nervis paullo validioribus multo laxioribus et minus stricte parallelis remotius a margine et magis arcuatim anastomosantibus, petalis pustulatis et sparse retrorso-setulosis recedens.

Arbor 6–12 m. alta, usque circiter 3 dm. diametro. *Ramuli* graciles, 2–4 mm. crassi, teretes, cortice fusco tenuiter striato, lenticellis ut videtur nullis. *Folia* oblonga vel elliptico-oblonga vel leviter oblanceolata, 13–20 cm. longa, 4–6·5 cm. lata, basi late vel angustius cuneata, raro subrotundata, apice abruptiuscule brevi-acuminata acumine obtuso, integerrima, angustissime incrassato-marginata margine ipso siccitate saepe brunneo basi reflexo vel revoluto, chartacea vel tenuiter coriacea, siccitate plerumque discoloria (supra fere semper viridia, subtus plerumque plus minus brunnescentia rarius etiam viridia), utrinque glaberrima

nisi raro pilis paucis brevissimis adpressis in costa subtus basin versus instructa, epidermi sub lente inter venulas minutissime granulosa vel "chagrinata," puncticulis plerumque obscuris vel inconspicuis ; costa subtus elevata, supra argute canaliculato-impressa ; nervi laterales primarii 12–15-jugi, late patuli, subrecti vel marginem versus leviter procurvi, demum 3–5 mm. a margine arcuato-anastomosantes, graciles, utrinque (subtus magis) prominuli ; venulae minores plerumque primariis parallelae sed saepe magis patentes, reticulum subinconspicuum efformantes ; totum rete venularum pro rata laxum ; petioli graciliusculi, 1–1·5 cm. longi, 1·5–3 mm. crassi, subteretes, supra angustissime et obsolete canaliculati, minute puberuli vel glabrescentes. *Inflorescentiae* terminales vel hinc inde ut videtur laterales, subsimplices, racemum fasciculorum pedunculatorum plerumque sistentes, 9–12·5 cm. longae, sparse (apicem versus densius) adpresso-puberulae ; ramuli (vel fasciculorum pedunculi) usque 1·2 cm. longi, dense griseo-subsericei, floribus delapsis noduloso-cicatricosi. *Pedicelli* graciles, sub anthesi usque 2·1 cm. longi, dense ochraceo-tomentelli, striati. *Sepala* leviter inaequalia, ovata vel oblongo-ovata, circiter 8 mm. longa, 3–5 mm. lata, usque ad tertiam partem connata, acutiuscula usque subobtusa, extra et intus dense adpresse ochraceo-subsericea, intus insuper longe setoso-villosa. *Petala* 20–22, filiformi-subulata, circiter 5 mm. longa, apice saepe uncinato-recurvata, intus superne conspicue albo-pustulata quoque pustulo setam brevem retrorsam gerente. *Stamina* circiter tot quot petala, circiter 4·5 mm. longa. *Ovarium* obovoïdeum, 2 mm. longum, longe densissime flavo-setoso-villosum. *Fructus* (e valvula unica semineque unico *Castro & Melegrito* 1684 tantum mihi cognitus) saltem 6·5 cm. longus, rugosus, loculicidus, ut videtur quadrivalvis et tetrasperma, valvula 3·5 cm. lata. *Semina* quadrantem sphaerae efformantia, 4 cm. longa, 2·7 cm. lata, angulo interno recto, laevia, castanea.

BRITISH NORTH BORNEO. Banguey [Banggi] Island, July–Sept. 1923, *Castro & Melegrito* 1684. Sine loc. vel dat., *Wood* 2275. Gandayon, swamp, 20 May 1931, *Goklin* in *B.N.B. For. Dept.* 2087 : "Tree, 30 ft. high, diam. 8 ins. ; flower white ; used for medicine" ; vernacular name *mangriau* (Dusun). Sandakan, on a hill at mile 13, alt. 18 m., 25 May 1932, *Md. Puasa* in *B.N.B. For. Dept.* 1722 : "Tree, 40 ft. high, diam. 8 ins. ; fruit green" [but specimen in flower !] ; vern. name *saukau* (Kedayan). Kabili-Sepilok Forest Reserve, Sandakan, 10 Apr. 1935, *Castro* in *B.N.B. For. Dept.* 4381 : "Flower green, yellow inside." Bettotan, Sandakan, top of hill, alt. 42 m., 26 Mar. 1935, *Puasa* in *B.N.B. For. Dept.* 4547 ; "Tree, 30 ft. high, 20 ins. girth ; flower olive green" ; vern. names *saukau* (Kedayan), *malindah* (Sungei). Kabili Forest Reserve, Sandakan, top of hill, alt. 9 m., 9 June 1935, *Puasa* in *B.N.B. For. Dept.* 4854 : "Tree, 40 ft. high, 36 ins. girth ; fruit olive green" ; vern. name *saukau* (Dusun). Kedayan Forest Reserve, forest, alt. 9 m., 30 Mar. 1936, *Apostol* in *B.N.B. For. Dept.* 5912 : "Tree, 20 ft. high, 7 ins. girth ; flower white" ; vern. name *karai* (Malay).

It is possible that this is the species listed as *Gonystylus bancanus* (Miq.) Gilg by Merrill, Pl. Elm. Born., in Univ. Calif. Publ. Bot. **25**, 184 (1929) and as *G. maingayi* Hook. fil. by Keith, Prelim. List N. Born. Pl. Names, 91, 177 (1938). I have, however, not yet seen the specimen cited by Keith (*B.N.B. For. Dept.* 2612), and of those cited by Merrill only

Elmer 21768 is represented at Kew, in the form of a poor duplicate. The latter is almost certainly not *G. bancanus* (Miq.) Baill., but is possibly a form of *G. maingayi* Hook. fil.

Gonystylus keithii, named in honour of Mr. H. G. Keith, Conservator of Forests in North Borneo, to whom Kew and many other establishments are indebted for abundant and excellently collected herbarium material of North Bornean plants, is the only species of the genus so far known from the lowlands of this area, and appears to be moderately frequent.

TENTATIVE KEY TO THE DESCRIBED SPECIES

Flowers large, up to 12·5 mm. long ; leaves up to 25 cm. long, strongly reticulate-veined and drying relatively bright green above ; petals about 40, glabrous ; fruit up to 6 cm. in diam. (Philippines) *reticulatus* (Elm.) Merr.

Flowers smaller, not exceeding 9 mm. in length ; leaves not usually drying bright green :

Inflorescence-branches elongating almost indefinitely, forming long cicatricose racemes with a few flowers at the apex at the time of flowering ; leaves up to 14 cm. wide ; petals 15–16, subulate, densely retrorse-setulose ; capsule (? always) very narrowly lanceolate, 6-costate (Sarawak ; ? Sumatra) . . . *augescens* Ridley.

Inflorescence-branches not elongating, bearing fascicles of flowers on short nodulose side-branches ; petals sparsely setulose or glabrous ; capsule spherical or broadly ovoid, not or scarcely ridged :

Petals represented by an entire shallow ring, 0·5 mm. high ; leaves opposite or subopposite; flowers in axillary peduncled umbels (W. Dutch Borneo ; not seen) . . . . *sympetala* Van Steenis et Domke.

Petals distinct; leaves alternate ; fascicles of flowers not usually subtended by leaves :

Flowers 8–10 mm. long, sepals relatively narrow, 3 mm. wide at base ; petals about 18, smooth and glabrous ; leaves large, up to 30 cm. long, drying a dark fuscous leaden colour (Sarawak) . . . . *calophyllus* Gilg.

Flowers smaller, under 8 mm. long :

Sepals relatively narrow, 2 mm. wide at base and 4–5 mm. long ; midrib of leaves distinctly and narrowly prominent above (cf. also *G. punctatus* A. C. Smith—Fiji) ; petals about 20, glabrous, pustulate (Sarawak) . . . . *stenosepalus* Airy Shaw.

Sepals relatively broader, deltoid or ovate, often ± imbricate ; midrib of leaves deeply impressed above :

Leaves conspicuously and copiously pellucid-punctate, 9–15 cm. long by 3–7 cm. wide, oblong, gradually narrowed to the obtuse or subacute apex (Fiji ; not seen) . . . . *punctatus* A. C. Smith.

Leaves not or obscurely punctate, generally more abruptly acuminate or cuspidate :

Leaves relatively large, 9–40 cm. long by 4–14 cm. wide ; petals numerous, subulate-filiform :

Leaves drying a dark fuscous or leaden colour, similar to *calophyllus;* petals 27–30, smooth and glabrous (Malay Peninsula) . . . . . *confusus* Airy Shaw.

Leaves drying yellowish or greenish or brownish, but not leaden :

Petals (20–22) pustulate and sparsely retrorse-setulose; leaves drying greenish above; venation rather lax (Brit. N. Borneo) . *keithii* Airy Shaw.

Petals glabrous, not setulose :

Petals (35–40) pustulate ; leaves large, up to 40 cm. long and 14 cm. wide, shagreened above, rather smooth below, drying yellowish-brown (Sumatra, Java) . . . . *macrophyllus* (Miq.) Airy Shaw.

Petals (c. 30) smooth, not pustulate ; leaves up to 20 cm. long and 9 cm. wide ;

Leaves thicker, minutely pubescent beneath, at least towards the base of the midrib (Malay Penins., Sarawak, Brit. N. Borneo) . . . *maingayi* Hook. fil.

Leaves thinner, quite glabrous beneath (Sarawak) . . . . *borneënsis* (Van Tiegh.) Gilg.

Leaves relatively small, 5–13 cm. long by 2–7 cm. wide :

Petals and stamens about 20, " dentiform " (S. Dutch Borneo ; not seen) . . . . *hackenbergii* Diels.

Petals 8–13*, ovate-acuminate :

Leaves elliptic, shagreened on both surfaces ; nerves slender but very prominent, especially below (Sumatra ; Sarawak) . . . . . . *forbesii* Gilg.

Leaves more oblong, smoother ; nerves much less prominent, especially below (Banka; ?Sarawak; ? Philippines) . . . . . . *bancanus* (Miq.) Baill.

Petals (number not stated) "filamentous, 3·5 mm. long, glabrous, . . . flattened and gradually tapering . . . , inwardly curved from the base; . . . stamens many"; leaves " thickly coriaceous, obscurely punctate, curing similarly dark brown on both sides " (Philippines; not seen) . . . . . *philippinensis* Elmer.

Petals and stamens unknown ; leaves " obovate . . . rather pale when dry, shining . . . ; lateral primary nerves . . . evident on both surfaces . . .; upper surface minutely puncticulate . . . the lower eglandular. The alliance . . . is with *Gonystylus philippinensis* Elm." (Philippines ; not seen) . . . . *obovatus* Merr.

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* Possibly related to *G. forbesii* and *G. bancanus* is *G. warburgianus* Gilg ex Domke in Biblioth. Bot. **27**, Heft 111, pp. 5, 8, 33, 146, t. iv, fig. 32 (1932). The name is a *nomen subnudum*, since the only information given about the species is that the sepals are united at the base into a cupuliform structure (pp. 5, 33) and that the petals and stamens are reduced to 12–9 (p. 8, and t. iv, f. 32). The type is said (p. 8) to be *Beccari* 2635, presumably from Sarawak.

NEW SPECIES AND VARIETIES OF THE PERSIAN FLORA : I.

DR. A. PARSA.

Chorispora persica *Boiss.* var. **stipitato-glandulosa** *Parsa*, siliquis glandulis stipitatis obsitis.

Kuhin, 1600 m., 1.5.38, *Parsa* 148.

Matthiola dentata *Parsa.*

Planta perennis 10–20 cm. alta, simplex vel basi ramosa, canescens, caule foliato in spicam pauciflorarr abeunte, floribus siccitate luteo-purpureis. *Caules* dense tomentosi, albi. *Folia* infima basalia minuta, 2×1·5 mm., obovato-spatulata, subintegra, obtusa ; caulina 2–2·5× 5–10 mm., obovato-spatulata vel inferiora suborbicularia, omnia tomentosa, supra subviridia, infimis exceptis abrupte cuneata, sensim petiolata, remote dentata, dente terminali paulo majore triangulari acutiusculo ; petiolus 3–5 mm. longus. *Sepala* exteriora basi bisaccata, adpressa, lineari-lanceolata, obtusiuscula, albo-hyalino-marginata, canescenti-tomentella, 1 cm. longa. *Petala* livido-flava vel purpurascentia, oblanceolata, obtusa, undulata, sensim in unguem longe (6–10 mm.) exsertum attenuata. *Stamina* calycem vel dimidia petala subaequantia. *Siliqua* tomentella, teres, 5–8 mm. longa, stigmate bicorni, cornibus divaricatis sub anthesi brevibus obtusis.

In Dalun, 400 m., 15.4.39. Steppo Lar Harirud, 700 m., 15.4.39; Parabedin, 1200 m., 1.4.40. Meshkamber, 1300 m., 14.6.41, *Parsa* 249.

In the sum of its characters this plant comes near to *Matthiola obovata. M. dentata* Parsa differs from it especially in the fruit being neither glabrous nor torulose.

Cleome arabica *L.* var. **lutea** *Parsa*, petalis luteis, siliquis angustioribus (3–5 mm. latis).

Bampour, 600 m., 6.5.39, *Parsa* 343.

Arenaria kourosii *Parsa* (§ 2 *Sclerophyllae* ; Boiss. Fl. Or. **1,** 690).

Planta pruinoso-glaucescens, caudicibus crassibus prostratis, caudiculis numerosis 1–5 cm. longis. *Caules* caespitosi, remote foliosi, tenuissimi, 8–15 cm. longi, simplices, glomerulo florum capitato-terminati. *Folia* turionum infima congesta, subulato-filiformia, triquetra, rigida, 3–5 mm. longa ; folia basalia et caulina 4–10 mm. longa, erecto-patula, angustissima, internodium subaequantia, basi connata, vaginulam albam brevem diametro caulis 2-plo longiorem efformantia ; folia summa infra capitulo sita, interdum vix 1 cm. longa, albo-hyalino-marginata, abrupte mucronulata. *Flores* 3–5, bracteis involucrati, in capitulam terminalem dispositi. *Bracteae* 3–4 mm. longae, paucae, glumaceo-hyalinae, sensim mucronulatae, ovato-lanceolatae, purpureo-maculatae, nervo purpureo percursae. *Sepala* 2–3 mm. longa et 1–1·5 mm. lata, bracteis conformia. *Petala* albida, retusa, obovato-elongata, calyce sublongiora. *Filamenta* 10, inclusa. *Ovarium* globosum, minusculum ; styli 3, filiformes, stigmatibus capitatis.

Kuh Dasht (Karaj), 2300 m., 20.5.41, *Parsa* 670.

The nearest affinity of *Arenaria kourosii* is with *A. tetrasticha* Boiss. Fl. Or. **1,** 698, but the following characters distinguish the new species from it : (1) our plant is not glabrous ; (2) each stem has one head of 3–5 flowers (and not a corymb) ; (3) the leaves are not scabrous ; (4) the sepals are not obtuse, and not glandular ; (5) the petals are obovate and nearly as long as the sepals.

Arenaria zargariana *Parsa* (§ *Eremogoneae* Fenzl ; Boiss. Fl. Or. **1,** 690).

Planta glaucescens, basi suffruticulosa ramosa, caudicibus prostratis caules numerosos edentibus. *Caules* tenues, semipedales, simplices, glabri vel sparsim hirtuli, glomerulo capitato terminati. *Folia* turionum brevissima, setacea, abrupte mucronulata, subcanaliculata, 3–5 mm. longa, plana ; caulina 10 mm. longa, adpresso-patula, angustissima, basi connata, internodio subbreviora, basi connata, vaginulam brevem diametro caulis 2-plo longiorem efformantibus ; folia summa 1–1·5 cm. longa, internodio 2–3-plo breviora. *Flores* numerosi, bracteis involucrati, in capitulam congestam terminalem magnitudine avellanae dispositi. *Bracteae* numerosae, latiusculae, ovato-oblongae, sensim attenuatae, setaceo-mucronulatae, 3–5 mm. longae, albido-hyalino-marginatae, dorso carinatae, nervo purpureo percursae. *Sepala* ovato-oblonga, acuta, magnitudine bractearum vel sublongiora, albida, subglandulosa, nervo purpureo percursa. *Petala* sparse hirtula, albida, obovato-oblonga, basi attenuata, integra vel retusa, calyce sublongiora. *Filamenta* inclusa. *Ovarium* ovoideo-globosum, glaberrimum, stylis 3.

Ali-abad (Ghom), 29.6.39, *Parsa.*

The material agrees morphologically with the type collection of *Arenaria polycnemifolia* Boiss. Fl. Or. **1,** 692, but the flowers of our specimen are numerous, the bracts are not green-keeled, and the petals are obovate-oblong instead of oblong-linear.

Hibiscus djabinianus *Parsa.*

Planta perennis, a basi ramosa, elatior, foliis petiolatis, floribus paucis sparsis roseis vel albis purpureo-maculatis, omnino foliis exceptis pilis albis longis patentibus vel retrorsis vestita. *Caudex* crassus, lignosus, longus, brunneus. *Caules* 30–40 cm. alti, teretes, a basi ramosi, pilis albis longis pubescenti-hirsuti. *Folia* longe petiolata, forma et magnitudine varia ; inferiora saepius minuta, 3–5–partita, laciniis obovato-oblongis acutiuscule lobatis, petiolis 3–5 mm. longis ; caetera 4–5-partita, laciniis obovato-oblongis subcuneatis lobatis, lobis obtusis ovatis, medio longiore oblongo ; superiora lobis angustioribus oblongo-lanceolatis ; omnia supra viridia, pilis parvis et longis simplicibus intermixtis, subtus pallida, pilis stellatis adpressis paucis obsita, marginibus plus minus longe et molliter albo-pilosis, nervis mediis longe et adpresse sparsim setosis. *Stipulae* mox emarcidae, setaceo-subulatae. *Petioli* infimi et caulini limbo sub-longiores, superiores limbo superati. *Bracteolae involucrales* numerosae, calycem subaequantes, lineari-setaceae, adpresso-patentes. *Calycis segmenta* ovato-lanceolata, acutiuscula, ut bracteolae pilis tuberculatis densissime scabrido-pubescentia. *Petala* alba, basi maculata, vel rosea prope basin violacea, obovata, nonnunquam

retusa, extra glanduloso-tuberculata, calyce sesquilongiora. *Capsulae* ellipticae, loculis oligospermis, seminibus minutis nigris tuberculatis.

Prope Chaharbahar, Tiss, 100 m., 8.5.39, *Parsa* 77.

The morphological affinity of this species is with *Hibiscus trionum* L. but the habit is different : our plant is a perennial and not an annual. The lower leaves are 3–5-palmately parted into obovate-oblong lobed segments (and not undivided as they are in *H. trionum* L.). The flowers are smaller and the calyx lobes are ovate-lanceolate. The petals are smaller (about 45 mm. long), white with a purple spot at the base or only purplish, and 1½ times as long as the calyx.

Hedysarum farinosum *Parsa* (sect. *Gamotion* § *Crinifera*).

Planta perennis. *Caules* subadscendentes, 5–15 cm. alti, adpresse albo-incani, simplices vel ramosi, teretes, substriati. *Stipulae* 2–3 mm. longae, connatae, albo-purpurascentes, triangulares, longe acuminatae, densissime adpresse pilosae. *Folia* 4–5 cm. longa, longe petiolata, 5–8-juga ; foliola elliptico-linearia vel elliptica, obtusa vel subretusa, mucronulata, supra parce pilosa, viridia, subtus dense adpresse canescentia, breviter petiolulata vel subsessilia, 3–12 mm. longa, 1–3 mm. lata ; pedunculi floriferi folia subaequantes vel iis vix longiores ; racemi ante anthesin ovati, subvillosi (non dense villosi), densi, ovati vel ovato-oblongi, 12–15 mm. longi et 8–12 mm. lati, deinde oblongo-cylindrici, usque 4–5·5 cm. longi. *Bracteae* albo-pilosae, lineari-filiformes, 1 mm. latae, tubum calycinum dimidium aequantes. *Pedicelli* 0·5–1 mm. longi, albo-pilosi. *Calyx* 5 mm. longus, tubo dense patulo-adpresse albo-hirsuto, dentibus inaequalibus subulatis longe acuminatis pilis albis densis patulo-adpressis obsitis tubo 2–3-plo longioribus corolla subbrevioribus. *Corolla* 6–7 mm. longa, roseo-striata ; vexillum (4·5×3 mm.) rectum (non falcatum), subobovatum, retusum, carina vix brevius ; carina 6·5–7 mm. longa, rectangularis, apice subrecta ; alae 3 mm. longae, subspatulatae, carina 2–3-plo calyce duplo breviores. *Legumen* (immaturum) 5·5 mm. longum, articulis 2 ovatis planis albo-hirtis setis longis purpureis obsitis.

Bodjnurd (Gifan), 1500 m., 20.5.39, *Parsa* 239.

The species here described forms a pretty plant with its white hairy stems and leaves and peduncled racemes of rose-coloured flowers. The fruit is covered with bright purple bristles. It is easily distinguished from *H. Wrightianum* Aitch. et Baker by : (1) the number and the shape of the leaflets ; (2) the colour of the flowers (not yellowish) ; (3) the length of the standard and wings (standard as long as wings in *H. Wrightianum*).

Astragalus (sect. **Alopecias**) **kourosianus** *Parsa.*

Perennis, caulibus pluribus decumbentibus ca. 20–25 cm. altis striatis apice subramosis dense sursum pilosis, pilis longis albis patentibus vestitis. *Stipulae* herbaceae, virides, lanceolatae, longe acuminatae, longe albo-pilosae, tuberculatae. *Folia* 2–5 cm. longa, 8–11-juga, rhachi longe albo-villosa ; foliola obovata vel elliptica, obtusissima vel subretusa, subsessilia, longe albo-villosa, maxima 5 mm. longa et 2·5 mm. lata. *Racemi* cylindrici, circiter 2 cm. lati et demum usque 5 cm. longi, densi

(18–22 fl.), villosissimi, in foliorum superiorum axillis siti, pedunculo 1·5–3 cm. longo pilis albis distantibus dense obsito suffulti. *Bracteae* lineari-subulatae, circiter 5 mm. longae et 0·5 mm. latae, longe albo-pilosae, calycis tubum superantes. *Calyx* tubulosus vel tubuloso-campanulatus, patens, dense albo-villosus, villis 1 mm. longis e tuberculo minimo ortis ; tubus 4 mm. longus et 2 mm. latus, 8–10–nervius ; dentes subulato-lineares, acuti, pilosi, tubo paulo longiores, uninervii. *Corolla* alba vel lutea ; vexillum 9 mm. longum, dorso fuscum, ungue subincurvo 2 mm. longo, lamina subpanduriformi 3 mm. lata apice retusa in unguem integrum constricta ; alae 9 mm. longae, obtuse auriculatae, unguibus tenuibus omnino liberis ; carina ca. 7 mm. longa, basi auriculata, unguibus ca. 4 mm. longis. *Legumen* immaturum ovoideum, dense tomentosum, stylo persistente mucronato ca. 5 mm. longo, in calyce inclusum ; stylus glaber.

Affinis *Astragalo crinito* Boiss. et *A. stojani* Nábělek. *A. crinita* Boiss. differt foliolis 20–25 jugis complicatis oblongo-linearibus acutiusculis supra glabris ; calycis campanulati dentibus tubo vix brevioribus ; vexillo integro ; legumine superne praesertim hirto. Ab *A. stojani* Nábělek *A. kourosianus* differt foliis 2–5 cm. (nec 8–18 cm.) longis ; vexillo 9 mm. (nec 23 mm.) longo, ungue non canaliculato, legumine immaturo longe et dense tomentoso (nec hirsuto), stylo glabro.

Hormud (Fars), 700 m., 15.4.39, *Parsa* 670.

Astragalus (**Myobroma**) **chrysanthus** *Boiss. et Hoh.* in Boiss. Fl. Or. **2,** 298, var. **elburzensis** *Parsa. Racemi* 3-flori, pedunculis dimidia folia aequantibus vel subsuperantibus, calycis dentibus tubo subduplo brevioribus.

Elburz, 3000 m., Aug. 1928, *Parsa.*

This plant is a variety of *A. chrysanthus,* from the typical variety of which it differs chiefly by the number of the flowers (3 and not 8–10), the length of the peduncles, which are much shorter than the leaves, and also by the calyx-teeth, which are nearly half as long as the tube (and not 5–6 times shorter than the tube).

Astragalus (**Alopecias**) **nadjafabadensis** *Parsa.*

Radix crassa, longa. *Caulis* elatus, 40–50 cm. longus, virens, pilis albis patulis densis vestitus, ramis crassis. *Stipulae* ovatae, basi connatae, sensim et longe acuminatae, 8–14 mm. longae. *Folia* longe petiolata, crassiuscula, cum rhachide petiolo duplo longiore, 10–20 cm. longa ; foliola 11–20–juga, utrinque pilis albis basifixis adpressis dense vestita, petiolulata, 13 mm. longa, 4–5 mm. lata ; foliola foliorum floralium minora, elliptica, apice rotundata subretusa, mucronulata. *Capitula* plura, ad nodos sessilia, globosa, multiflora, 10–20 flora, 5 cm. usque longa ; flores sessiles, majusculi, 17 mm. usque longi, siccitate flavido-violascentes. *Calyx* subcampanulatus, tubo luteo 5 mm. longo extra densissime albo-piloso (velutino-tomentoso), dentibus anguste linearibus 5–6 mm. longis viridibus longe albo-pilosis. *Corolla* sicca flavida, dein violescenti-ochroleuca (viva probabiliter violacea vel lilacina) ; vexillo calyce sesquilongiore unguiculato (20 mm. longo, ungue 4 mm. longo), lamina glabra ovata apicem versus sensim attenuata integra rotundata basi sub-auriculata, alis breviter unguiculatis carina subbrevioribus ; carina elata basi breviter auriculata, apice biloba. *Ovarium* villosum.

In incultis Nadjafabad, Arak, 1890–2000 m., 10.6.40, *Parsa* 556.

In general appearance *A. nadjafabadensis* resembles *A. ponticus* Pall. (Boiss. Fl. Or. **2,** 408), but the calyx of our species has long teeth and long hairs. It is distinguished from *A. megalotropis* C. A. Mey. (Boiss. Fl. Or. **2,** p. 415) by : (1) the number of leaflets, which are hairy at both sides, retuse, mucronulate (and not acute) ; (2) its yellow-violet flowers (and not only violet) ; its oval (not suborbicular) standard.

Lotus pumilus *Parsa* (sect. *Ononidium* Boiss. Fl. Or. **2,** 174).

Herba annua, prostrata, adpresse cano-velutina, subsericea, caulibus tenuibus nanis 2–5 cm. longis. *Stipulae* lanceolato-triangulares, acutae, minutissimae. *Folia,* inferioribus simplicibus ellipticis exceptis, trifoliolata, longe petiolata, petiolis adpresse albo-pilosis 3–12 mm. longis, foliolis obovatis obtusis vel retusis subsessilibus 4 mm. longis et 2·5 mm. latis utrinque adpresse albo-pilosis supra viridibus subtus canescentibus. *Pedunculi* axillares, folio subduplo longiores, subtriflori, apice 1-bracteati. *Calyx* 3 mm. longus, albo-pilosus, corolla vix brevior, bilabiatus, labio superiore bifido inferiori tridentato, laciniis lanceolato-triangularibus acuminatis acutis, labii superioris tubo subaequilongis, labii inferioris tubo 2–3–plo longioribus ; vexillum 3 mm. longum, orbiculatum, apice purpureum, carinam subtus sensim curvatam vix superans. *Legumen* 5–7 mm. longum, 1 mm. latum, calyce 2–3–plo longius, adpresse albo-pilosum, lineare, subarcuatum, 7–9–spermum.

Bandar Abbas (Abergarm), 100 m., 23.4.39, *Parsa.*

This species is closely allied to *L. stocksii* Boiss. (Fl. Or. **2,** 174) from which it differs in: (1) the number of flowers (3 and not 1); (2) flower pedunculate (and not without peduncle) ; (3) calyx-lobes not equal; (4) standard not ovate; (5) pods curved, mucronate, much longer than calyx.

Colutea gifana *Parsa* (sect. *Eucolutea*).

Frutex (?) ramis glabris virgatis inermibus, cortice brunneo-albescente longitudinaliter striato. *Folia* remote imparipinnata, 2-juga ; foliola elliptica vel suborbicularia, mucronulata, crassiuscula, glauca, utrinque glabra, 3–7 mm. longa, 2·5–5 mm. lata. *Racemi* 4–5–flori, longe pedunculati ; pedunculo 12–15 cm. longo in axilla folii superioris orto glabro vel glabriusculo striato basi squamas duas 2 mm. longas apice subobtusas purpureas pilosas gerente. *Flores* nutantes, magni, 13–20 mm. longi. *Calyx* tubuloso-campanulatus, 4 mm longus, adpresse albo-hirtulus, dentibus triangularibus acutiusculis uninerviis tubo vix brevioribus. *Corolla* flavo-aurea, vexillo orbiculari sursum curvato apice retuso basin versus breviter angustato glabro, carina apice fisso truncata longe unguiculata lamina cordato-auriculata, alis linearibus longe et obtuse auriculatis. *Antherae* aureae. *Ovarium* adpresse puberulum, utrinque angustatum, stylo sub stigmate circinnatim convoluto et ibidem intus albo-piloso.

Gifan, Bodjnurd, 1300 m., 21.5.39, *Parsa* 238.

The species described above is closely related to *C. persica* Boiss. Fl. Or. **2,** 196, from which it differs chiefly by : the number of leaflets, length of peduncles (much longer than the leaves) ; calyx teeth not acuminate, and not 5 times shorter than the tube ; standard truncate ; wings not longer than keel. This plant is associated with a *Hymenocrater*.

Amygdalus horrida *Spach* var. **alliariana** *Parsa*, foliis spathulatis (nec lanceolatis) acutiusculis (nec acutis) subintegris distinguitur.

Parabedin (Bandar Abbas, Sirdjan), 900 m., 24.4.39, *Parsa* 92.

Rosa iberica *Boiss.* Fl. Or. **2,** 687, forma **alba** *Parsa*, corolla alba (nec rosea) a planta typica differt.

Steppe of Polezangulé (North Persia), 2400 m., 14.6.37, *Parsa*.

Rosa gallica L. (*Boiss.* Fl. Or. **2,** 676), forma **lutea** *Parsa*, corolla magna lutea a planta typica recedit.

Hadjilar, 3.5.35, *Parsa* 167.

The types of all the above new species, varieties, and forms are in the Kew Herbarium.

The genus Fissipetalum *Merr.*—This genus, with the single species *F. borneënse* Merr., was described by Merrill in Journ. Straits Branch R.As. Soc. **1922** (85), 168–9 (1922), and referred with doubt to the *Olacaceae*. From this family it was excluded by Sleumer in Engl.–Harms, Nat. Pflanzenfam. ed. 2, **16b,** 32 (1935). Examination of authentic material shows that *Fissipetalum* is congeneric with **Erycibe** *Roxb.* (*Convolvulaceae*), and *F. borneënse* appears to be closely related to *E. glomerata* Bl. (*E. albida* Prain). Dr. S. J. van Ooststroom is at present revising *Erycibe* (cf. *Blumea* **3** (2), 267 : 1939), and I therefore refrain from making any transfer.

H. K. Airy Shaw.

TROPICAL AFRICAN PLANTS : XIX*.

Gomphrena celosioides *Mart.* [Amaranthaceae] in Nov. Act. Nat. Cur. **13,** 301 (1826) ; Suessenguth in Fedde, Rep. Sp. Nov. **35,** 309 (1934); Sandwith in Kew Bull., 1946, 4 (1946).

BELGIAN CONGO. Katanga, on railroad track at Mokambo, July–Aug., 1919, *Burtt-Davy* 18086. Lovoi–Kamina, Mar., 1932, *Quarré* 2877.

UGANDA. Kampala, in Government Plantation, *Liebenberg* 1048. Serere, Teso, on gravel paths, roads, etc., 1100 m., *Chandler* 33.

KENYA. Kavirondo, Kisumu, in dryish grassland just above lake, 1100 m., Oct., 1926, *Maitland* 1373.

TANGANYIKA. Moshi, 900 m., 12th Oct., 1928, *Haarer* s.n. Moshi, 800 m., Feb., 1928, *Haarer* 999. Tanga, common in grass on paths and roads, 15 m., 4th Nov., 1929, *Greenway* 1823. Dar es Salaam, common in grassland, 1928, *Marshall* 5. Mpwapwa, on old lands around buildings, 5th Jan., 1929, *Hornby* 59.

ZANZIBAR. Without locality, 1931, *Vaughan* 1100.

PORTUGUESE EAST AFRICA. Beira, on sandy flats, April, 1921, *Dummer* 4668.

NYASALAND. Makwapala, 700 m., 4th Mar., 1934, *Lawrence* 151.

SOUTHERN RHODESIA. Salisbury, Makabusi Valley, 1400 m., Jan., 1917, *Eyles* 570. Salisbury, 1914, *Craster* 182. Manica District, Odzani River Valley, 1915, *Teague* 418.

NORTHERN RHODESIA. Fort Jameson, 1000 m., 1st Jan., 1936, *Winterbottom* 21. Choma, by the railway, 13th Aug., 1929, *C. I. Sandwith* 182. Mazabuka, 1000 m., 22nd Aug., 1931, *Central Research Station* 465. Mwinilunga District, weed on lawn of Matonchi Farm, 16th Nov., 1937, *Milne-Redhead* 3271 (see Bot. Archiv. **41,** 79 : 1940).

I am grateful to my colleague, Mr. N. Y. Sandwith, for identifying this common denizen of eastern Africa with *Gomphrena celosioides*, a native of South America. When the account of the *Amaranthaceae* was written in the Flora of Tropical Africa the species was still unrepresented at Kew from the area covered by the Flora. It appears to have become established in a number of places during the second decade of this century and to have spread rapidly, for it is now a common weed in many places as is shown by the above citations. It is not, however, represented at Kew by specimens from Angola or the Anglo-Egyptian Sudan, neither has it yet been sent in from the area covered by Hutchinson and Dalziel, Flora of West Tropical Africa. Suessenguth (l.c.) cites several gatherings from Natal and the Transvaal. For many years this species has been masquerading in Africa under the name of *G. decumbens* Jacq., a species which is not represented at Kew from Tropical Africa.

E. MILNE-REDHEAD.

Impatiens niamniamensis *Gilg* [Balsaminaceae] in Engl., Bot. Jahrb. **43,** 104 (1909).

I. bicolor Hook. f. in Journ. Linn. Soc. Lond. **6,** 7 (1862) non Royle (1839); Hook. f. in Hook., Bot. Mag. **89,** t. 5366 (1863) ; Oliv. in Oliv., Fl. Trop. Afr. **1,** 299 (1868).

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* Continued from Kew Bull., 1940, 66 (1940).

I. dichroa Hook. f. ex Gilg in Engl., Bot. Jahrb. **43,** 104 (1909), non Hook. f. (1908); Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 142 (1927).

Unfortunately J. D. Hooker's names for this striking species are illegitimate, both being later homonyms. *Impatiens niamniamensis* Gilg was described as a species closely allied to Hooker's plant, and differing from it in indumentum and habit, characters now shown to be unsound in the light of additional material from the Belgian Congo and Uganda. I therefore adopt *I. niamniamensis* Gilg to cover the species in the broad sense. The colour of the spur varies from deep purple to deep crimson or flame, whilst the standard and lateral petals, always paler than the spur, are often almost white. The species is frequent through the forest areas of tropical Africa from the Cameroons Mountain in the west to the Kenya side of Lake Victoria in the east, whilst a specimen of a closely allied or possibly identical species has been collected in the Uluguru Mountains in Tanganyika. A crimson-flowered form has recently been introduced into cultivation at Kew from Entebbe, Uganda.

E. MILNE-REDHEAD.

Syzygium huillense (*Hiern*) *Engl.* [Myrtaceae] in Engl., Bot. Jahrb. **54,** 339 (1917).

Eugenia guineënsis (Willd.) Baill. ex Laness. var. *huillensis* Hiern, Cat. Afr. Pl. Welw. **1,** 359 (1898), pro parte, quoad *Welwitsch* 4401.

Syzygium mumbwaënse Greenway in Kew Bull., 1929, 196 (1928).

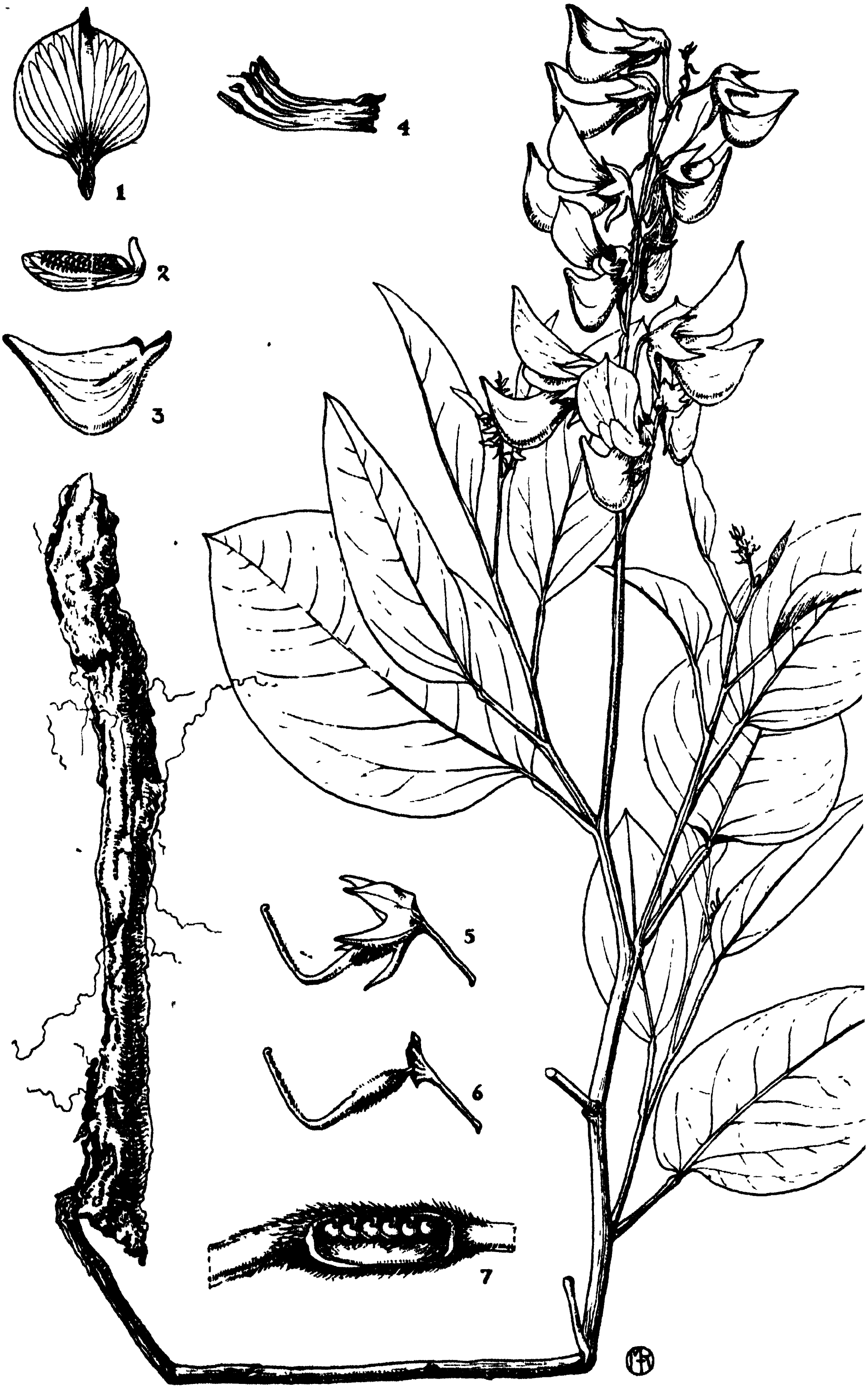
BELGIAN CONGO. Katanga : Kansenze, 16th Aug., 1931, *de Witte* 575.

SOUTHERN RHODESIA. Between Umtali and Salisbury, Nov.–Dec., 1899, *Cecil* 47 :—dwarf bush, 3–6 dm. high ; [galled] flowers olive green. Between Salisbury and Bulawayo, Nov., 1899, *Cecil* 80 :—bushes 3–6 dm. high, forming wide patches. St. Friars Mission, Febr., 1917, *Mundy* 3195 : grows in the grass and has edible fruits.

NORTHERN RHODESIA. R. Kankasa, on anthill, 22nd Dec., 1907, *Kässner* 2101. Namwala District. Very common in sandy dambos at Namwala, 1150 m., Sept., 1932, *Trapnell* 1106 :—behaves as a "geophyte" or subterranean shrub here, but this may be due to fire ; fruit eaten by natives ; Chitonga name *higisu* ; Chiïla name *sichisu*. Sandy dambos at Namwala, 1150 m., Nov., 1932, coll. *Gordon Reid, Trapnell* 1179 :—geophyte. Mumbwa District. Chibuluna vlei near Mumbwa, *Macaulay* 995 (type of *S. mumbwaënse* Greenway) :—undershrub. Ndola District. In vleis at Ndola, Oct., 1906, *Allen* 309 :—shrubby growth. Mwinilunga District. In dambo just W. of R. Dobeka near Matonchi Farm, on drier sandy ground at edge of boggy grassland, 1500 m., 11th Oct., 1937, *Milne-Redhead* 2701 :—dwarf shrub with woody rootstock ; leaves light green, calyx yellowish ; flowers white ; fruit eaten by natives.

ANGOLA. Huilla District. Between Mumpulla and Nene, abundant in bushy pastures, Oct., 1859, *Welwitsch* 4401 (type) :—a dwarf shrub, 2–3 dm., very gregarious, quasi-caespitose ; stems erect or ascending ; flowers white ; fruit edible.

E. MILNE-REDHEAD.



Crotalaria unicaulis Bullock. Whole plant (× 2/3) ; 1, standard (× 1) ; 2, wing (× 1) ; 3, keel (× 1) ; 4, half a staminal bundle (× 1) ; 5, calyx and gynoecium (× 1) ; 6, do. with calyx-lobes removed (× 1) ; 7, ovary with side removed to show ovules (× 2⅔).

Baphia pyrifolia (*Desv.*) *Baill.* [Papilionaceae] in Bull. Soc. Linn. Par. **1**, 445 (1885).

Delaria pyrifolia Desv. in Ann. Sci. Nat. ser. i, **9**, 406 (1826).
Carpolobia dubia G. Don, Gen. Syst. **1**, 370 (1831), non *Baphia dubia* De Wild.
Bracteolaria polygalacea Hook. f. in Hook., Niger Fl. 322 (1849).
Baphia polygalacea (Hook. f.) Bak. in Oliv., Fl. Trop. Afr. **2**, 248 (1871).

Botanists do not appear to have adopted Baillon's combination for this well-known West African plant.

E. MILNE-REDHEAD.

Crotalaria unicaulis *Bullock* [Papilionaceae] in Kew Bull., 1931, 271 (1931) ; descriptio a *Milne-Redhead* emendata et ampliata.

Herba perennis ; radix cylindrica, descendens, circiter 1 cm. diametro et 25 cm. longa vel ultra. *Caules* solitarii, erecti, simplices vel furcati, teretes, plus minusve sulcati, glauci. *Folia* petiolata vel interdum sessilia, unifoliolata, exstipulata ; petioli adscendentes, 18–23 mm. longi, supra late excavati, glabri ; foliola ovata, elliptica vel late oblanceolata, 8 cm. longa, 5 cm. lata, apice acuta, vix acuminata, basi cuneata vel rotundata, matura glabra, immatura subtus adpresse pubescentia ; costa et nervi laterales, praecipue subtus, prominentes. *Inflorescentiae* racemosae, terminales, 6–13-florae, usque 10 cm. longae ; rhachis glabrescens ; bracteae subulatae vel lineari-lanceolatae, circiter 5 mm. longae, glabrescentes ; pedicelli adscendentes, circiter 1·5 cm. longi, medium versus bracteolis duabus minutis caducis instructi. *Calyx* 5-dentatus, glaber ; tubus 5 mm. longus, circiter 10 mm. latus ; dentes lanceolati, acuti, 7 mm. longi, basi 5 mm. lati. *Vexillum* late ovatum vel suborbiculare, 24 mm. longum, 17 mm. diametro, apice acutum, basi breviter unguiculatum, valde plicatum, luteum, extra nervis brunneis ornatum ; alae obovato-oblongae, circiter 16 mm. longae, apicem versus 5 mm. latae, unguiculatae, luteae ; carina paullo infra medium rotundata, apice rostrato-acuminata, basi breviter unguiculata, 23 mm. longa, 11 mm. lata, viridi-lutea, rostro luteo. *Stamina* fertilia antheris ultra 4 mm. longis praedita ; stamina abortiva fertilibus paullum longiora, antheris valde redactis. *Ovarium* stipitatum, circiter 6 mm. longum, villosum, ovulis ± 12 ; stylus circiter 20 mm. longus, infra medium curvatus, superne rectus, postice pilosus, stigmate glabro. *Legumen* ignotum.

NORTHERN RHODESIA. Mwinilunga District. In bush [probably near Kalene Hill], c. 1400 m., Nov. [1928 ?], *Marks* 10 (type) :—shoots single, not in clumps, 2–3 dm. ; flowers bright yellow, darker at back of petals.

ANGOLA. Moxico District. Just N. of R. Ysenga by path through native gardens, 15th Jan., 1938, *Milne-Redhead* 4133 :—perennial with vertical rootstock ; stems erect, glaucous, dull purple or grey-green ; leaflets rather blue-green, slightly glaucous below ; calyx green tinged dull purple ; standard outside yellow speckled brownish, inside yellow ; wings yellow ; keel yellow-green with yellowish beak.

The above additional gathering of this distinct species, from Angola, shows it to be a perennial. Only the two upper leaves of the type specimen are typical, as the additional material shows that there is normally a definite petiole separated from the lamina by an articulation. The lower leaves of Miss Marks' plant have the lamina narrowing gradually into the petiole, a condition which must be considered abnormal. I am indebted to my wife for the illustration of *C. unicaulis*, which is based on the Angola gathering.

E. MILNE-REDHEAD.

Vigna paludosa *Milne-Redhead*, sp. nov. [Papilionaceae] ; a *Vigna racemosa* (G. Don) Hutch. et Dalz. inflorescentia breviore, bracteolis longioribus, vexillo bilobato, carina in rostrum spiraliter recurvata, petalis flavis, legumine recto valde hirsuto, seminibus subquadratis hilo longo instructis valde distincta.

Herba, forsan perennis, volubilis. *Caules* foliosi, pilis longis retrorsis dense vel parce induti. *Stipulae* lanceolatae, acutae, basi in calcar lanceolatum 2–3 mm. longum productae, in toto usque 12 mm. longae, longe hirsutae. *Folia* trifoliolata ; petioli usque 4·5 cm. longi, retrorsim longe hirsuti ; foliola lanceolata vel ovato-lanceolata, haud lobata, lateralia paulum obliqua, usque 7 cm. longa et 2 cm. lata, utrinque praesertim ad nervos parcissime longe hirsuta ; petioluli circiter 2 mm. longi, densiusculi hirsuti ; rhachis circiter 5 mm. longa, ut petioli hirsuta ; stipellae oblongae, 1·5 mm. longae, glabrae. *Pedunculi* axillares, 6–13 cm. longi, usque 6-flori, apicem versus densius adpresse retrorsim hirsuti. *Flores* brevissime racemosi, racemis circiter 10 mm. longis, per paria dispositi ; pedicelli 1·0–1·5 mm. longi, glabri, bibracteolati ; bracteae lineari-lanceolatae, 7 mm. longae, longe hirsutae ; glandula conspicua intra quoque pari pedicellorum sita ; bracteolae lineari-lanceolatae, usque 7 mm. longae, longe hirsutae. *Calyx* late campanulatus, 4 mm. longus, hirsutus ; dentes late triangulares, tubo breviores. *Vexillum* glabrum, bilobatum, unguiculatum, circiter 12 mm. longum et 12 mm. latum. *Alae* oblique obtriangulatae, basi anguste unguiculatae, ungue usque 3 mm. longo, supra unguem breviter acute calcaratae, in toto circiter 12 mm. longae et 7 mm. latae. *Carina* valde elongata, superne in rostrum spiro-recurvata, apice truncata, basi unguiculata, circiter 10 mm. longa (statu curvato), basin versus 4 mm. lata, apice 1·5 mm. lata. *Stamina* circiter 19 mm. longa, cum carina contorta ; antherae 0·6 mm. longae. *Ovarium* sessile, lineare, 6 mm. longum, dense adpresse hirsutum ; stylus circiter 17 mm. longus, inferne filiformis, glaber, superne leviter incrassatus compressusque, curvatus, postice apicem versus longitudinaliter barbatus ; stigma obliquum. *Legumen* lineare, rectum, circiter 3·5 cm. longum, 6 mm. latum, breviter rostratum, pilis longis brunneis indutum ; semina circiter 6, subquadrata, crassa, leviter compressa, circiter 3 mm. diametro, saturate brunnea, hilo 3 mm. longo instructa.

SIERRA LEONE. Port Loko District. Port Loko, 1st Dec., 1914, *N. W. Thomas* 5845. Port Loko, 15th Dec., 1914, *N. W. Thomas* 6520, 6523, 6634. Mange Bureh, in moist place, 11th Jan., 1928, *Deighton* 1043 :—herbaceous climber, flowers yellow, fruits covered with bristles. Bombali District. Makump [near Magburaka], near stream, 9th Dec., 1928, *R. R. Glanville* 119 :—creeper with yellow flowers. Kambia

District. Rokupr [Kupr], common among grass in swamps, 29th Jan., 1935, *Deighton* 2953 (type) :—flowers yellow. Rokupr, in marsh, 22nd Jan., 1945, *Deighton* 4050 :—flowers yellow.

At first sight, at least in the dried state, this plant suggests *Vigna racemosa* (G. Don) Hutch. et Dalz., for in habit, leaf-shape and indumentum of the stems there is great similarity between these two species. However, the much shorter inflorescence, the bracteoles nearly twice the length of the calyx, the broader, almost bristly, straight legume, and the subquadrate seed with long hilum are sufficient characters easily to separate *V. paludosa* from *V. racemosa.* Examination of the flowers provides characters even more striking. The deeply bilobed standard and the elongate recurved keel petals enclosing the very long stamens and style, recalling those of *Vigna macrorrhyncha* (Harms) Milne-Redhead (a widely spread glabrous species as yet unrecorded from farther west than Nigeria), are markedly different from those of *V. racemosa,* whilst the yellow colour of the flowers of *V. paludosa* serves readily to separate the species in the living state.

Whilst *V. racemosa* appears to grow in dryish habitats, *V. paludosa* has a liking for wet places, in riverside grasslands and swamps. The species appears to be very local in its distribution, and has not yet been recorded outside Sierra Leone.

Landolphia calabarica (*Stapf*) *E. A. Bruce,* comb. nov. [Apocynaceae].

Carpodinus calabaricus Stapf in Kew Bull., 1894, 19 (1894).

Landolphia ? *bracteata* Dewèvre, Caoutch. Afr. Monogr. Landolph. 31 (1895).

Caralluma speciosa (*N.E. Br.*) *N.E. Br.* [Asclepiadaceae] in Gard. Chron. Ser. 3, **12,** 370 (1892) et in Dyer, Fl. Trop. Afr. **4** (1), 479 (1903) ; Berger, Stapelieen und Kleinien, 77 & fig. 17, 1–2 (1910) ; White et Sloane, The Stapelieae, ed. 2, **1,** 243 & fig. 184 (1937), et in Cactus and Succulent Journ. America **12,** 82 & fig. 2 (1940).

Sarcocodon speciosus N.E. Br. in Journ. Linn. Soc. Lond. **17,** 170, fig. 12, 4–8 (1878).

Caralluma codonoides K. Schum. in Engl. Pflanzenw. Ost-Afr. **C,** 328 (1895) ; N.E. Br. in Dyer, Fl. Trop. Afr. **4** (1), 480 (1903) ; Berger, Stapelieen und Kleinien, 77 (1910); White et Sloane, The Stapelieae, ed. 2, **1,** 245 and figs. 182, 183, 185 et **3,** 1178 (1937).

C. oxyodonta Chiov., Fl. Somala, **2,** 298 & fig. 174 (1932); White et Sloane, The Stapelieae, ed. 2, **1,** 233 & fig. 172 (1937).

BRITISH SOMALILAND. Hargeisa, on top of limestone escarpment, 1600 m., 25th Sept., 1932 (fl.), *Gillett* 4056 :—flowers dark red, foetid smell ; vernac., *udab tis* (stink, useless). Wagga Mt., 2000 m., Feb. (fl.), *Lort Phillips* s.n. :—large flower-head size of man's fist.

ITALIAN SOMALILAND. Near Brava, Mogadoxo, Nov., 1875 (stems recd. March, 1876; flowers in spirit, Sept., 1876), *Kirk* s.n. (type). Oltregiuba District ; Chisimaio, near Afmadu (fl.), *P. Gorini* 37 (type of *C. oxyodonta*) :—flowers maroon with yellow cup in centre.

TANGANYIKA TERRITORY. Mkomazi valley, Kalamba-Mnazi, common in open places in *Acacia-Euphorbia* desert country, 500 m., 13th Jan., 1930 (fl. & fr.), *Greenway* 2052 :—a much branched, succulent herb, 3 dm. high, with greenish-brown stems and very dense clusters of reddish-brown to almost black, evil-smelling flowers with red-haired fringed perianth segments. W. Usambara. Mkomazi, in dense clumps in reddish soil in *Acacia* desert grass formation, about 500 m., 22nd April, 1934 (flr.), *Greenway* 3938 :—perennial succulent herb up to 6 dm. tall with clusters of dark reddish-brown evil-smelling flowers. Mkomazi-Kihurio, common, but scattered, in *Acacia-Sansevieria* desert grass formation, about 650 m., 9th Sept., 1935 (fl.), *Greenway* 4067 :—a much branched, procumbent, succulent, perennial herb, up to 6 dm. tall, with dark brownish-crimson, dense, globular heads of evil-smelling flowers blotched with dirty yellow at centre ; stems 4-angled, brownish-green with grey-brown line at angles. Journey to Kilimanjaro, between Gonja and Kihurio, frequent in very dry succulent-steppe, beginning of July, 1894 (fr.), *Volkens* 2382 (*type of *C. codonoides* K. Schum.) :—angled, spiny, leafless, like a succulent *Euphorbia*, 25 cm. high with a cluster of almost black, foetid flowers, which in size and shape resemble *Campanula Trachelium*. Succulent-steppe between the northern slopes of Usambara Mts. and Kihurio, 9th Oct., 1902 (fl.), *Engler* 1522a. East foot of Pare, in succulent-steppe near Kihurio, about 700 m., 16th Dec., 1901 (fl.), *Uhlig* 811 :—flowers brown-black-violet. Mombo, 10th Oct., 1911 (fl.), *Braun* 3711. Mkumbara-Kihurio steppe, 17th Aug., 1908 (fl.), *Koestlin* 1951 :—flowers dark brown-red, smell of old cheese.

The type of *C. speciosa* (N.E. Br.) N.E. Br. is represented by four pieces of stem received from Dr. Kirk in March, 1876, and twelve flowers received in spirit (since dried) the following September. As the flowers were originally placed in spirit they have lost colour and some indumentum but have more or less retained their size. These factors have to be taken into consideration when comparison is made with other material. The main distinctions between *C. speciosa* and *C. oxyodonta* are in the size of the inflorescence and the structure of the corona. According to observations made in the field by the late Mr. B. D. Burtt the former character varies considerably within a species and is not of specific importance.

The latter character, the corona structure, has been carefully examined and in this respect *C. oxyodonta* agrees exactly with *C. speciosa* (the corona having the five deeply bifid outer lobes and the small subquadrate inner ones). The figures of the corona depicted in Fl. Somala, **2,** 299, fig. 174 (2–4), and reproduced in White and Sloane, *l.c.* fig. 172, which show five entire acute outer corona lobes, are incorrect. The specimen (*Dr. P. Gorini* 37) agrees in other respects with the type of *C. speciosa* and there is little doubt that these two species are synonymous.

There has already been some question as to the validity of *C. codonoides* as a distinct species. The original description was very incomplete and comparison from it was impossible ; this has since been amplified by Miss Obermeyer (White and Sloane, ed. 2, **3,** 1178), so that a good description is now available. The flowers from the *type* of *C. speciosa* present a rather different appearance because of their original preservation in spirit, and their colour cannot be determined, but according to field collectors the colour of other specimens collected in Somaliland agrees very well with those from Tanganyika.* The papillose inner surface of the corolla described by Miss Obermeyer seems to be a variable character, and may depend to some extent on the method of preservation of the specimens. This character is visible in some flowers from Somaliland and Tanganyika, whereas in others it cannot be distinguished. The flower size, corona structure and stem characters of these specimens agree very well and there are no real grounds for retaining *C. codonoides* as a distinct species.

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* The type specimen of *C. codonoides* (Volkens 2382) consists of two pairs of follicles and a small "capsule" containing seeds ; there are no flowers or stems, though these are described on the collector's label.

E. A. BRUCE.

Ixora rhodesiaca *Brem.* sp. nov. [Rubiaceae] ; maxime ut *I. radiata* Hiern, sed statura, foliis, floribus minoribus, inflorescentia minus congesta, corolla extra puberula, tubo intus glabro ab ea recedens.

Frutex sempervirens, 1·80 m. altus, ramis foliisque glabris. *Rami* novelli complanati, sicc. striati, mox tamen teretes, 3–4 mm. diam. *Folia* plerumque sessilia, interdum tamen petiolo usque ad 1·5 mm. longo munita ; lamina anguste elliptica vel oblonga, 11–15 cm. longa et 4·4–6·4 cm. lata, foliorum superiorum interdum ovata, 8–14·5 cm. longa et 4·5–7 cm. lata, apice acuta et mucronata, basi obtusa, rotundata vel subcordata, coriacea, supra nitidula, sicc. haud conspicue decolorata, nervis utroque latere costae 9–11 subtus prominentibus et supra sicut reticulatione prominulis. *Stipulae* 5 mm. longae, basi in vaginam 1·2 mm. altam connatae, lamina carinata infra late et supra anguste triangulari et conduplicata intus ad basin villosa. *Inflorescentia* pedunculata, trichotome corymbosa, valde contracta tamen, puberula, floribus circ. 27. *Pedunculus* 1–2·5 cm. longus, internodio brevi foliis rudimentariis vel parvis interdum tamen usque ad 2 cm. longis munito praecessus. *Internodia* infima trichotomiae 3·5 mm. longa ; alia paulo breviora. *Pedicelli* florum lateralium triadis usque ad 2 mm. longi ; flos centralis subsessilis. *Bracteae* ovatae vel triangulares, infimae 3 mm. longae ; aliae breviores. *Bracteolae* florum lateralium basi ovarii insertae, triangulares, 0·7 mm. longae ; flos centralis ebracteolatus. *Ovarium* ovoideum, 1·3 mm. altum, puberulum. *Calyx* puberulus, tubo 0·6 mm. alto ; lobis triangularibus 1·4 mm. longis interdum inaequalibus. *Corollae* tubus extra minute puberulus, intus glaber, 4 cm. longus et 1 mm. diam. ; lobi elliptico-oblongi, 8 mm. longi et 3·2 mm. lati, intus sparse puberulo-pubescentes, obtusi, margine recurvati. *Stamina* filamentis 1·5 mm. longis ; antheris 6 mm. longis. *Stylus* glaber, stigmatibus 2 mm. longis comprehensis 4·5 cm. longus.

NORTHERN RHODESIA. Mwinilunga District. In evergreen vegetation by River Matonchi, below the dam, 21st Oct., 1937, *Milne-Redhead*

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* Since the original writing of this note, Mr. P. R. O. Bally, a keen collector of Stapelieae, has informed me that this species also occurs in Abyssinia and in Kenya in the following localities :—Sagalla, Ndara, Magadi and Maktao. This additional information is of value in linking up the distribution of *C. speciosa*, which is now shown to occur from Somaliland and Abyssinia southward through Kenya to Tanganyika Territory.

2888 (type in Herb. Kew) :—flowers fading, white tinged pink ; fruits green turning to orange red and blackish purple.

C. E. B. BREMEKAMP.

Morinda morindoides (*Bak.*) *Milne-Redhead*, comb. nov. [Rubiaceae].

[*Morinda longiflora* (non G. Don.)—Hiern in Oliv., Fl. Trop. Afr. **3,** 192 (1877), pro parte].
Gaertnera morindoides Bak. in Kew Bull., 1892, 83 (1892).
Morinda confusa Hutch. in Kew Bull., 1916, 11 (1916).

Under Art. 60 of the International Rules the epithet *confusa* must be rejected as illegitimate, since at the time of its publication an earlier validly published epithet was available. The rejection by Hutchinson (l.c. 9) of the epithet *morindoides* on the grounds of its incongruity in combination with the generic name *Morinda* is not permitted under Art. 59 of the International Rules.

Pavetta coriacea *Brem.* [Rubiaceae] in Fedde, Rep. Sp. Nov. **37,** 69 (1935).

The type-specimen and another specimen, both collected by G. F. Scott Elliot on the Ruwenzori Expedition of 1893-94, are erroneously cited by Bremekamp (l.c.) as coming from Mt. Ruwenzori. Both these specimens were collected on Stevenson Road, either in Northern Rhodesia or Nyasaland.

E. MILNE-REDHEAD.

Pentas zanzibarica (*Klotzsch*) *Vatke* [Rubiaceae] in Oesterr. Bot. Zeitschr. **25,** 232 (1875).

Pentanisia zanzibarica Klotzsch in Peters, Reise Mossamb. Bot. 286 (1861).
Pentas purpurea Oliv. in Trans. Linn. Soc. London, **29,** 83 (1873) ; Hiern in Oliv., Fl. Trop. Afr. **3,** 46 (1877).

It appears that Klotzsch's epithet, which is twelve years earlier than Oliver's, should be adopted for this well-known species.

E. MILNE-REDHEAD.

Sarcocephalus latifolius (*Smith*) *E. A. Bruce*, comb. nov. [Rubiaceae].

Nauclea sambucina T. Winterb., Acc. Sierra Leone, **2,** 45 (1803), nomen nudum.
N. latifolia Smith in Rees, Cycl. **24,** no. 5 (1819).
Sarcocephalus esculentus Afzel. ex Sab. in Trans. Hort. Soc. Lond. **5,** 442 (1824).
Cephalina esculenta (Afzel. ex Sab.) Schumach. et Thonn., Beskr. Pl. Guin. 105 (1827).
[*C. scandens* (non Thonn.)—DC. Prodr. **4,** 368 (1830), pro synon.]

Tarenna rhodesiaca *Brem.*, sp. nov. [Rubiaceae] ; speciebus angolensibus *T. Gossweileri* S. Moore et *T. catocensi* R. Good affinis, sed foliis basi acutis, floribus majoribus a *T. Gossweileri*, foliis numero nervorum majore instructis subtus pubescentibus, floribus congestis, calycis lobis pubescentibus a *T. catocensi* distinguenda.

Frutex sempervirens, 4·5 m. altus. *Rami* novelli complanati, dense scabrido-pubescentes, deinde obtuse quadrangulares et mox cortice brunneo opaco vestiti, indumentum tamen diu retinentes. *Foliorum* petiolus dense pubescens, 7–14 mm. longus ; lamina elliptica, plerumque 9–13·5 cm. longa et 4·3–6·5 cm. lata, acuminata, basi acuta, subcoriacea, supra nitida, sicc. saturate olivaceo-brunnea vel subnigra, supra costa scabrido-pubescente excepta glabra, subtus primum tomentosa, deinde costa nervisque dense et inter nervos sparse pubescens, domatiifera, domatiis tamen sub pilis difficile distinguendis, nervis utroque latere costae 5–9 supra subimpressis subtus prominentibus, venulis laxe reticulatis subtus prominulis. *Stipulae* 7–8 mm. longae, basi brevissime connatae, lamina ovato-triangulari extra subglabra in aristam pubescentem ea paulo breviorem exeunte intus margine scarioso excepto sericeo-villosa. *Inflorescentia* breviter pedunculata, dense pubescens, floribus 9–15 congestis ; pedunculus 7 mm. longus ; internodia basalia ramulorum infimorum 5 mm. longa ; internodium basale axis brevius ; bracteae infimae ut folia stipulis normaliter connectae, 3 mm. longae ; bracteae aliae estipulatae, 2·5–3 mm. longae ; bracteolae ab ovario paulum remotae, 1·5–2 mm. longae ; bracteae bracteolaeque margine ad basin glanduliferae. *Ovarium* ovoideum, 2·5 mm. altum, dense adpresse pubescens ; ovulis utroque loculo circ. 10. *Calyx* dense adpresse pubescens, intus glaber, tubo 1·2 mm. alto, lobis triangularibus subcarinatis 2·3 mm. longis. *Corollae* tubus viridulus, 3·9 cm. longus et 1·8 mm. diam., extra glaber, intus dimidio superiore arachnoideus ; lobi eburnei, oblongi, 10 mm. longi et 2·8 mm. lati, basi minute auriculati, apice mucronulati. *Staminorum* filamenta glabra, 1·6 mm. longa ; antherae sicc. torsae, 8·5 mm. longae. *Discus* glaber. *Stylus* parte inclusa pilosus, basin versus tamen glabrescens, 5·6 cm. longus.

NORTHERN RHODESIA. Mwinilunga District. Evergreen vegetation by River Lunga at Mwinilunga, 22nd Nov., 1937, *Milne-Redhead* 3335 (type in Herb. Kew) :—evergreen shrub, 4·5 m. ; leaves glossy green above, paler and pubescent below ; calyx-tube whitish, lobes green ; corolla-tube greenish-cream ; lobes 5, cream-coloured.

C. E. B. BREMEKAMP.

Echinops (§**Phaeochaete**) **reticulatus** *E. A. Bruce*, sp. nov. [Compositae—Cynaroideae] ; ab *E. Mildbraedii* Mattf. foliis basi auriculato-cordatis subtus glandulosis nec arachnoideo-lanatis, nervis reticulatis valde distincta.

Herba 0·7–1 m. alta, erecta, superne ramosa, ramis patenti-adscendentibus 20–30 cm. longis. *Caules* herbacei, sulcati, dense glanduloso-hispidi, sparse arachnoideo-lanati, internodiis parte inferiore 1·5 cm. superiore circiter 0·5 cm. longis, capitulis terminati. *Folia* alterna, sessilia, erecto-patentia ; lamina integerrima, sagittato-lanceolata, basi auriculato-cordata, amplexicaulis, apice acuta, 3–10 cm. longa, basi 0·7–2·7 cm. lata, apice sensim angustata, supra setis pungentibus dense obsitis, subtus glandulosa, nervis prominentibus valde reticulatis glanduloso-hispidis, nervo medio basin versus leviter arachnoideo, margine setis paullo validioribus obsita. *Capitulum generale* circiter 3 cm. diametro, globosum, solitarium, brevissime pedunculatum. *Capitula* *partialia* (propria) numerosa ; involucrum circiter 1·5 cm. longum ; involucri setae stramineae, 3–4 mm. longi ; bracteae circiter 20 ; exteriores spathulatae, margine superne setoso-pungentes, circiter 5 mm. longae, apicem versus circiter 1 mm. latae, spinescentes ; intermediae anguste lanceolatae, longe acutae, spinescentes, margine laxe setosae, circiter 13 mm. longae, infra medium circiter 2·5 mm. latae ; intimae basi connatae, anguste oblongae, margine apicem versus denticulatae, apice acutae, spinescentes, circiter 1·3 mm. longae, 2 mm. latae. *Corolla* glabra, caerulea, 15 mm. longa, usque ad medium incisa, lobis circiter 1 mm. latis. *Antherae* circiter 7 mm. longae, caudis 1 mm. longis. *Achaenia* (immatura) villosa.

UGANDA. West Nile Province. Kobopo, January, 1938, *C. Hazel* 420 (type) : —in open grassland ; height 6–9 dm., flowers dark blue.

Inula decipiens *E. A. Bruce*, nom. nov. [Compositae].

Inulaster macrophyllus Sch. Bip. ex A. Rich., Tent. Fl. Abyss. **1,** 399 (1847).
Inula macrophylla (Sch. Bip. ex A. Rich.) Sch. Bip. ex Schweinf. et Aschers. in Schweinf., Beitr. Fl. Aethiop. 285, 307 (1867), non Kar. et Kir. (1841).

Aloë zanzibarica *Milne-Redhead*, nom. nov. [Liliaceae].

Aloë concinna Bak. in Dyer, Fl. Trop. Afr. **7,** 461 (1898), non *A. concinna* (Haw.) Roem. et Schultes (1829).

A new name is necessary for this distinct little *Aloë*, since Baker's name is illegitimate, the epithet having been used earlier for the plant now known as *Haworthia viscosa* (L.) Haw. var. *concinna* (Haw.) Bak.

Anthericum dimorphum *von Poellnitz* [Liliaceae] in Bol. Soc. Brot. sér. 2, **16,** 43 (1942).

[*A. triflorum* (non Ait.)—Bak. in Dyer, Fl. Trop. Afr. **7,** 493 (1898), quoad spmn. ex Mt. Malosa.]

NYASALAND. Chamba River south of [Mt.] Namitawa, 1200 m., Sept., 1902, *McClounie* 101 (type in Herb. Berol. destroyed, neotype in Herb. Kew). Same locality and date, *McClounie* 100. Mt. Malosa, 1200 -1800 m., Nov.-Dec., 1896, *Whyte* s.n., pro parte.

PORTUGUESE EAST AFRICA. Near Lake Nyasa, 1902, *W. P. Johnson* 536.

A. dimorphum was described from a duplicate of *McClounie* 101 at Berlin, presumably now destroyed, which had been distributed from Kew without data and which was cited as coming from "Britisch Zentralafrika : Ubi ?, 1903." It was collected near the Chamba River south of Mt. Namitawa in September, 1902. Mt. Namitawa is situated on the present Northern Rhodesia/Nyasaland frontier, the actual boundary being the watershed. As the Chamba River is a tributary of the R. Lufira flowing east into Lake Nyasa, it is safe to assume that the type locality of *A. dimorphum* is in Nyasaland.

E. MILNE-REDHEAD.

Crinum (**§Stenaster**) **minimum** *Milne-Redhead*, sp. nov. [Amaryllidaceae], affine *C. parvo* Bak. sed foliis angustissimis, perianthii tubo lobis longiore, scapo foliis breviore facile distinguenda.

Bulbus ovoideus, circiter 7 cm. diametro, collo circiter 3 cm. longo instructus. *Folia* circiter 7, erecta, spiraliter disposita, anguste linearia, usque 17 cm. longa et usque 2·5 mm. lata (plerumque angustiora), haud striata vel conspicue nervata, usque ad apicem bulbi sub finem cujusque temporis incrementi marcescentia, basibus eorundem foliorum proximo tempore ita recrescentibus ut folia nova efficiant, probabiliter per compluria tempore incrementi persistentibus ; margines laeves. *Scapus* lateralis, 4–10 cm. longus, circiter 5 mm. diametro, semper uniflorus. *Spathae valvae* 2, persistentes, lineares, inferne expansae 4·5–6 cm. longae, apice acutae, papyraceae. *Pedicellus* 0·5 mm. longus, teres. *Flos* zygomorphus. *Perianthii tubus* subcylindricus, apice leviter ampliatus, 8·5–12 cm. longus, circiter 5 mm. diametro, leviter arcuatus ; *lobi* subaequales, anguste lanceolati, 6·5–9 cm. longi, exteriores 10–11 mm. interiores 13–14 mm. lati, apice acuti, patentes. *Stamina* fauci perianthii tubi affixa : filamenta filiformia, circiter 8 cm. longa, declinata, subaequalia ; antherae lineari-oblongae, usque 17 mm. longae, leviter curvatae. *Ovarium* ellipsoideum, haud lobatum, circiter 13 mm. longum et 7 mm. diametro ; ovula circiter 6 pro loculo. *Stylus* filiformis, bene exsertus, cum staminibus declinatus. *Stigma* integrum vel minute trilobatum, papillosum. *Capsula* non visa.

NORTHERN RHODESIA. Mwinilunga District. Cha Mwana (Chibara's) Plain, plentiful locally in sandy ground towards edge of plain with *Parinari capensis* Harv. and a rhizomatous *Entada* sp., 14th Oct., 1937, *Milne-Redhead* 2761 :—bulb about 7 cm. in diameter ; leaves spirally arranged, not wrapped round each other at base because too narrow, linear, crescent-shaped in section, all but youngest with imperfect apices ; perianth tube greenish, segments white with broad pink median line outside, white inside, very acute; flower zygomorphic; stamens declinate ; style and filaments white below, mauve above.

Crinum minimum is by far the most delicate and graceful species known. It exhibits great morphological reduction, not only in general size but in the number of flowers per umbel and in the width of leaves. The fruit unfortunately is unknown.

It appears to be a very local plant, being apparently absent from several similar sandy plains in the neighbourhood of Matonchi Farm. Had not Capt. K. R. Paterson, with whom I was staying, told me that he had seen a small *Crinum* growing on Chibara's Plain and directed me to the locality, I would never have collected it. Even there it was plentiful only over a small part of this large sandy plain although similar vegetation extended hundreds of yards farther on.

Juncus dregeanus *Kunth* [Juncaceae], Enum. 344 (1841) ; Buchenau in Engl. et Prantl Pflanzenr. **4** (**36**), 251 (1906).

UGANDA. Bugishu, Bulambuli, 2700 m., 4th Sept., 1932, *A. S. Thomas* 573 :—locally common beside stream ; tufted, 3 dm. high ; tepals black. Butandiga, 2100 m., April, 1930, *Liebenberg* 1715. Mt. Elgon, local by stream in bamboo zone, 3300 m., Jan., 1918, *Dummer* 3463. Ruwenzori, without definite locality, 3000 m., April, 1932, *Oliver* 27.

I am indebted to Dr. H. Weimarck of Lund for the recognition of the above-cited specimens as the South African rush, *Juncus dregeanus*.

Not only is this a new record for Tropical Africa but it is a very considerable northern extension of the range of the species. Although it is now known to occur on both Mt. Ruwenzori and Mt. Elgon, it has not yet been gathered outside Uganda. It is to be hoped that it may be found not only on the Kenya side of Mt. Elgon, but also on some of the other East African mountains.

E. MILNE-REDHEAD.

TYPIFICATION OF NEW NAMES DERIVED FROM PERSONS OR PLACES.

H. K. AIRY SHAW.

In Sprague & Milne-Redhead's note on the type of *Ormocarpum kirkii* (*K.B.* 1934, 42) and in Nelmes's paper on *Carex oederi* Retz. (*Journ. Bot.* **77**, 301 : 1939), there is a conflict of two opposing principles of typification which it seems important to recognize. In each of these two papers the authors reach the conclusion that the type of the name is the specimen upon which the accompanying description was mainly or entirely based. This indeed seems, at first sight, logical enough. But the result is that the types of the names *O. kirkii* and *C. oederi* are specimens with which Kirk and Oeder respectively had no connection. This result is at variance with the principle embodied in Recommendation XV (f) of the International Rules : " Not to name a species after a person who has neither discovered, nor described, nor figured, nor in any way studied it."* " Botanists should avoid using a collector's name as a specific epithet unless the type-specimen was gathered by that collector " (Sprague & Milne-Redhead, *l.c.* 43). Compare also *Aristida capensis* var. *dieterleniana* Schweickerdt in *K.B.* 1939, 653 (1940), based upon *Dieterlen* 1205 and *Celliers* 11; the latter specimen is expressly designated as the type, in contravention of the principle mentioned.

As stated, it is implied, in both the papers cited above, that the type of a new name must be the specimen or figure forming the basis of the accompanying description. But these two cases seem to indicate that in certain circumstances this need not necessarily be so. " Oeder's Sedge " was based upon at least two distinct elements: (A) the figure in Oeder, *Fl. Dan.* tab. 371; (B) a specimen (of *C. pilulifera* L.) in Herb. Retz. The name was derived from the first element ; the description was drawn up from the second. Is there not some reason for typifying

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* A recent surprising example of the breach of this principle is Merrill and Perry's naming of three new Bornean species of *Syzygium* as *S. houttuynii*, *S. christmannii* and *S. panzeri*, in *Mem. Amer. Acad. Arts & Sci.* **18** (*Mem. Gray Herb.* **4**) (1939). Houttuyn, Christmann and Panzer had, of course, no connection whatever with the three species described.

" Oeder's Sedge " by Oeder's plant? Suppose that the specimen in Herb. Retz. had actually represented an undescribed species, instead of the well-known *C. pilulifera* L. It would then have been logical, not to call the new species *C. oederi*, but to give it a new name, such as "*retzii*," reserving the epithet *oederi* for Oeder's plant.

This treatment falls into line with the procedure enjoined by the International Rules when a new combination is found to have been based upon a misidentification, as in the case of *Tsuga mertensiana* (Bong.) Carrière (Art. 54, last example). Personal or geographical names used as the basis of names of new taxonomic groups may, in fact, be regarded as analogous to name-bringing synonyms in new combinations : they should " indicate the type." The typification of *Carex oederi* by Retzius's specimen of *C. pilulifera* would be analogous to the typification of *Tsuga mertensiana* by Carrière's accompanying description of *T. heterophylla* (Raf.) Sarg.

The writer makes these observations in no dogmatic spirit, since there is clearly room for two opinions in the instances cited. The case for typifying a species by the element indicated by its specific epithet does not, however, appear hitherto to have been sufficiently stressed. Where it is a question of two collections,—the collector, in the one case, providing the new epithet, and the specimen, in the other, (mainly) providing the accompanying description, as in *Ormocarpum kirkii* and in *Aristida capensis* var. *dieterleniana*—it may be best to follow the course advocated by Sprague & Milne-Redhead. But where, as with *Carex oederi*, the new epithet is derived from a personal name referring to an earlier publication, and a new description is provided based on material misidentified with it, there seem to be strong grounds for typifying the new name by the reference which that name indicates, if only to avoid needless multiplication of misnomers.

Analogous to the cases discussed above is that of a new epithet derived from a place-name, or the situation arising when such a name is based upon a misidentification. For example, *Poa amboinica* L. *Mant. Alt.* 557 (1771) was based upon *Phoenix amboinica montana* Rumph. *Herb. Amboin.* **6,** 19, t.vii, fig. 3 (1750), and also upon specimens collected in S. India by Koenig from which Linnaeus drew up his description. Fischer has shown (*K.B.* 1934, 398–400) that these specimens are referable to *Eragrostis riparia* (Willd.) Nees, an Indian species not occurring in Amboina. Though Merrill is not correct in stating (*Interpr. Rumph. Herb. Amboin.* 88 : 1917) that *P. amboinica* L. " is based wholly on Rumphius's description and figure," I agree with him and with Fischer that, since Linnaeus adopted, from Rumphius, the geographical epithet *amboinica*, the species should be typified by the Rumphian reference.

The points here brought forward may be summarised in the following " considerations for typification " :—

I. " Where the name of a species based on material from two or more collectors embodies the name of one of them, the species shall be typified by that collector's cited specimen (or one of that collector's cited specimens) unless it can be clearly shown that the accompanying description was mainly based upon other material." (Substituted for Point 1 of Sprague & Milne-Redhead's note, K.B. 1934, 43.)

II. " When a new taxonomic group, *bearing a name derived from that of a person or place*, is based upon two (or more) elements, one of which (A) is a reference to a previously published description or figure *in which the name of the authority (or artist) or of the locality cited, forms the source of the new name*, and another (B) is a new description based upon living or herbarium material,—either of which elements would validate the new name under the provisions of Art. 37,—the new name should, other things being equal, be typified by the element (A) *indicated by the name* in question (and not by the material forming the basis of the accompanying description), in accordance with the type method prescribed by Art. 54. In the event of the two elements being considered taxonomically distinct, the name will be retained for element (A), element (B) being re-named if not otherwise identifiable."

A. P. D. JONES.—It is with the deepest regret that we record the death, on 8th October, 1946, of Alan Philip Dalby Jones at the age of 28. Jones took Honours in Botany at Cambridge University in 1940, and subsequently a degree in forestry at Oxford. He was appointed to the Colonial Forest Service as an Assistant Conservator of Forests under the Nigerian Government, and was forthwith given charge of the botanical side of the work of the Forest Department

Philip Jones was a man of engaging cheerfulness, abounding energy, and with an inspiring enthusiasm for the science which he loved so much. Apart from his very large contributions to herbarium material and his researches into taxonomy, he brought an unusual brilliance to bear upon the complicated ecology of the West African forests, and in his few years in Nigeria gained a deeper insight into it than any other man. But despite his absorption in botany as a pure science, he was aware that his work must nevertheless ultimately serve the practical ends of everyday forestry, and in this respect alone his loss will be hard to replace. Even in his short career he made beginnings and left ideas behind him that cannot but be of the utmost value to those who follow. His published work is slight, for he was sensitive of the fact that it would be misleading to give to the world findings which he knew required yet deeper research; but it is possible, however, that some of his nearly completed reports can be rendered suitable for publication. The Forest Herbarium at Ibadan is a lasting memorial to his energy and skill.

His loss will be greatly felt in the Kew Herbarium, where his readiness to assist with the provision of material specially needed in the elucidation of some taxonomic problem or other, and his willingness to place his wide knowledge of the Nigerian flora at our disposal, made Jones a very valued correspondent. He will be mourned not only by his colleagues of the Nigerian Forest Department but by all the numerous botanical workers with whom he came in contact.

REVIEW.

Researches of Dr. E. D. Merrill.—The editors of Chronica Botanica have issued a volume* as homage to Dr. E. D. Merrill on the occasion of his seventieth birthday on 15 October 1946. The volume consists mainly of reprints of 23 selections from Dr. Merrill's published works, and is prefaced by an outline biography of important happenings in his varied and very full life and by a bibliography of his published works, whose titles and references make a list of 13½ pages.

Dr. Merrill's name will always be associated with the botanical exploration of Malaysia and especially of the Philippines on which he commenced publication in 1902. The Philippine Journal of Science was established in 1906 largely at the suggestion of Dr. Merrill, who was one of the co-editors. The herbarium of the Bureau of Science, Manila, was initiated in 1902, the first specimens being those collected by Dr. Merrill in that year. Twenty years later it contained 275,000 mounted specimens. The total loss of the building and its contents in 1945, during the re-occupation of Manila near the end of the Japanese war, must have been felt by Dr. Merrill as a great personal loss, and the sympathy of his fellow botanists throughout the world can do little more than indicate the magnitude of the tragedy. In one respect only is the loss to science less than might be estimated by those unacquainted with Dr. Merrill's methods, and, one should add, generosity. Thanks to the collecting of large numbers of duplicates and their presentation to many of the great taxonomic institutions in other parts of the world, future research workers on the Philippine flora will be able to settle problems involving typification and the many other aspects of systematic research with much less trouble and uncertainty than might be expected. Moreover, Merrill's care, lucidity, and reasonableness in drawing up descriptions make type specimens of less general importance than where descriptions are incomplete, ambiguous, or inaccurate.

Naturally, in the selection of reprinted papers attention has been given more to articles of general interest than to those purely taxonomic in a very specialized sense. Perhaps it is a pity that at least one paper with descriptions of new species was not reprinted. However, those selected indicate Merrill's wide interest more particularly in taxonomy *sensu latissimo*, in phytogeography, and in economic botany. Mention may be made of the papers on the flora of Borneo, the phytogeographic separation of Formosa and the Philippines, the correlation of the indicated biologic alliances of the Philippines with the geologic history of Malaysia, domestic plants in relation to the diffusion of culture, and some economic aspects of taxonomy. One is impressed throughout Merrill's work by his eminent balance, his refusal to accept the latest hypothesis as the key to all problems, and his undogmatic apprisal of opposed viewpoints knowing that all essential facts are not yet in evidence for the establishment of final theories.

W. B. TURRILL.

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* Merrilleana, a selection from the general writings of Elmer Drew Merrill, Sc.D., LL.D. Chronica Botanica **10**, no. 3/4 (1946). 4 dollars.

THE BOTANICAL NAME OF THE WILD TETRAPLOID WATERCRESS.

H. K. Airy Shaw.

Howard & Manton, in their paper " Autopolyploid and Allopolyploid Watercress, with the description of a new species " (*Ann. Bot.*, n. ser., **10,** 1 : 1946), have concluded that the allopolyploid plant represents an undescribed form, to which they have given the name *Nasturtium uniseriatum*, sp. nov. The only earlier names which they explicitly take into consideration (*l.c.* 11) are *N. siifolium* Reichb., *N. microphyllum* Boenningh. ex Reichb., and " *N. parvifolium* of Petermann " (i.e. *N. officinale* var. *parvifolium* Peterm., *Fl. Lips. excurs.* 482 : 1838) ; but they say that these " all appear to be diploid and are thus not prior names for the tetraploid."

Certainly *N. siifolium* can be ruled out : Reichenbach's excellent plates (*Ic. Bot. Pl. Crit.* **9,** t. 840, fig. 1132 : 1831 ; *Ic. Fl. Germ. Helv.* **2,** t. 50, fig. 4361 : 1837–8) leave us in no doubt as to its identity. But the grounds for assuming *N. microphyllum* and *N. officinale* var. *parvifolium* to be diploids are not clear. Howard & Manton do not state whether they have examined type material of either of these forms. Manton, in her earlier paper on " The cytological history of Watercress " (*Zeitschr. f. indukt. Abstamm. u. Vererbungsl.* **64** (1), 133 : 1935), says that " 'var. *microphyllum*' is referred to by Hooker (1870) as merely a starved terrestrial state," and that this description is " almost certainly correct." Apart from the fact that var. *microphyllum* is not mentioned in the first (1870) edition of Hooker's *Student's Flora* (p. 22)—it was added in the third edition, 1884 (p. 25)—Hooker's statement is surely inadequate as it stands, since he failed to distinguish the diploid and tetraploid forms. From the footnote on p. 138 of Manton's 1935 paper we learn that she had specimens of a " starvation ' var. *microphyllum* ' type " in cultivation (from a wild source) which had the *tetraploid* number of chromosomes (64) ! This statement is in conflict with Howard & Manton's statement, quoted above, that all these forms " appear to be diploid." It is evident that both the diploid and the tetraploid can produce starved terrestrial states on occasion.

NASTURTIUM MICROPHYLLUM BOENNINGH. EX REICHB.

Reichenbach's figure of *N. microphyllum* Boenningh. (*Ic. Fl. Germ. Helv.* **2,** t. 50, fig. 4360 : 1837–8) unfortunately shows a plant in young fruit only. Its general appearance, however—especially its large flowers and slender pedicels and siliquae—is very much that of *N. uniseriatum*, and I believe that it represents that species. Although only an examination of authentic material can positively decide this point, Mr. Howard now agrees with me that the probability of the specific identity of *N. uniseriatum* and *N. microphyllum* is so great that its assumption is justified in the absence of conclusive evidence to the contrary. *N. microphyllum* could otherwise only be the triploid hybrid, and Mr. Howard does not believe it to be this.

Reichenbach's original description of *N. microphyllum* (*Fl. Germ. excurs.* 683 : 1832) is short and inconclusive ; it may be translated : " erect, leaves pinnate, lateral leaflets free at the base, subpetiolulate, oval, acute, terminal one rounded, angled. Reichb. *Pl. Crit.* XI. ic. . . . [unpublished]. Slender habit of *Cardamine amara*, leaflets smaller, flowers intermediate between that and *Nasturtium officinale* ; axils without rootlets, short fruit of *Nasturtium*. *N. turfosum* Kz., of Chile, its nearest relative, differs in its elongate siliqua.—In marshy ground, in ditches in meadows, e.g. in Westphalia at Coesfeld, Rothenfelde (*von Boenninghausen*) ; neighbourhood of Leipzig, at Abtnaundorf (*Reichenbach*). June—autumn. Perennial." The references to " short fruit," and to the " elongate siliqua " of *N. turfosum*, might at first suggest that *N. microphyllum* was a form of the diploid, but, as already indicated, the figure could well represent a young fruiting stage of the allopolyploid. It has been so interpreted by several French botanists : cf. Boreau, *Fl. Centre France*, ed. 3, **2**, 37 (1857), where the " siliques plus effilées " are explicitly mentioned, and Rouy & Foucaud, *Fl. France*, **1**, 204–5 (1893)—" siliques grêles " ; the latter authors also, probably correctly, treat var. *parvifolium* Peterm. as distinct. Syme, *Engl. Bot.*, ed. 3, **1**, 177 (1863), draws attention to the long petals and fruit-pedicels (up to 15.5 mm. [7.3 lines] long) shown in Reichenbach's figure of *N. microphyllum*. Both these characters tend to weight the balance strongly in favour of identification with the tetraploid. No material of *N. turfosum** has been available for comparison.

VAR. PARVIFOLIUM PETERMANN

Of *N. officinale* var. *parvifolium* Petermann, *l.c.*, little need be said : it was described as " terrestrial, erect, dwarf, 2–6 inches high ; leaves often consisting of only 3 leaflets ; leaflets smaller, shortly petiolulate." It is probable that this was the form intended by Hooker by "var. *microphyllum* "—a starved terrestrial state, which can doubtless be assumed, in suitable conditions, by either the diploid or the tetraploid. The two names are equated, as *N. officinale* var. *microphyllum* (Boenningh.) Beck,† by Thellung in Hegi, *Ill. Fl. Mittel-Eur.* **4** (1), 320 (1918). Petermann's type should be examined. It may possibly turn out to represent the same form as var. *praecox*‡ S. F. Gray and/or var. *paucijugatum* S. F. Gray, *Nat. Arr. Brit. Pl.* **2**, 678 (1821), or as *Sisymbrium nasturtium* var. *minor* Van Hall, *Fl. Belg. Sept.* (*Fl. Noord-Nederl.*) **1**, 488 (1825).

DICTYOSPERMA OLGAE REGEL

A further name remains to be considered which may provide the valid name for the allopolyploid watercress in the event of *N. microphyllum* being shown not to apply to it. In 1882, in a paper giving descriptions of new plants collected by the botanist Olga Fedchenko in Turkestan and Kokan, Central Asia, Ernst Regel described a new genus and species of Cruciferae,

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* Kunze ex Walpers in *Nov. Act. Phys.-Med. Acad. Nat. Cur.* **19**, Suppl. i. 247 (1843).

† An incorrect citation, since Beck, *Fl. Nieder-Österr.* **2** (1), 464 (1892), published it as *Roripa nasturtium* var. *microphylla*. Cf. chronological list of names, *infra* (p. 43).

‡ Var. *precocius* DC. *Regn. Veg. Syst. Nat.* **2**, 189 (1821).

Dictyosperma olgae.[*] It was described as a flaccid herb with the habit of *Cardamine*, the stems angled and rooting at the base, the leaves pinnatisect, the siliquae somewhat terete, elevate-nerved, the seeds uniseriate, immarginate, scarcely compressed, and, under a lens, covered with a cellular reticulation with exceedingly minute spinules arising therefrom. Curiously enough it was not compared with *Nasturtium officinale*, but only with *Barbarea*, *Cardamine* and *Arabis*, " from which the subterete elevate-nerved siliquae and the seed-structure easily distinguish it." The generic name was shortly afterwards found to be a later homonym of *Dictyosperma* Wendl. et Drude, 1875 (Palmae), and was therefore altered by Durand & Jackson, *Ind. Gen. Phanerog.* 494 (1888), to *Pirea* Dur. et Jacks.

Attention was first drawn to the relation of this plant to *Nasturtium* by Lipsky, Materials for a flora of Central Asia, in *Acta Horti Petrop.* **18,** 7 (1900) (see also his introduction, p. II). " Examination of specimens, both authentic and collected later," he writes, shows that it is " none other than the common *Nasturtium officinale* R. Br.—the form with elongate siliquae, which occurs also in Europe. . . . Siliquae identical with those of *Dictyosperma* (*Pirea*) *Olgae* can be seen in herbaria from various countries—Germany, France, Greece, Caucasus, Abyssinia." Actual specimens from these countries were cited on the next page (p. 8). Bush, in Kuznetsov, Bush and Fomin, *Fl. Cauc. Crit.* **3** (4), 79, 323–4 (1909) (see also his introduction, pp. XXIII, XXXIII, XXXVI, LV), treated it as var. *olgae* Busch (siliquae longer and slenderer than type, 16–27 mm. long,[†] 1–1.75 mm. broad, much curved), adding : "Its distribution is actually extremely wide. It has even been introduced into North America !" This is confirmed by specimens in the Kew Herbarium. Hayek, however, in his "Entwurf eines Cruciferen-Systems auf phylogenetischer Grundlage" (*Beih. Bot. Centralbl.* **27,** ii.: 1911), considered that it was scarcely separable even as a form from *N. officinale.* Most subsequent authors, e.g. Vasilchenko in Komarov, *Fl. URSS.* **8**, 143 (1939), have likewise attached little importance to the plant. Specimens in the Kew Herbarium, authenticated by Lipsky, put its identity beyond doubt.

GANDOGER'S MICRO-SPECIES

At least two of the micro-species into which *N. microphyllum* Reichb. was divided by Gandoger, *Fl. Eur.* **2,** 287 (1884), appear to represent the tetraploid, viz. *N. longirameum* Gand., from Waterford (*Britten*), " siliqua 20–21 mm. longa, 1.5 mm. lata," and *N. stylosum* Gand., from Liverpool (*Harbord*), " siliqua 18–20 mm. longa."

CONCLUSION

For the present, until it is known whether Boenninghausen's type specimen of *N. microphyllum* is extant, and, if extant, whether it can be definitely assigned either to the diploid or to the tetraploid, it is suggested that the wild tetraploid watercress may be referred to as **Nasturtium microphyllum** *Boenningh. ex Reichenb.*, *sensu Boreau* (1857). In view of the rather long tradition (1857–1893) in France of this interpretation of *N. microphyllum*, it might even be expedient to adopt this designation for the tetraploid in the event of the type being found to have been lost or destroyed, or being not definitely assignable. The writer, however, considers that there is such a strong presumption of Reichenbach's figure (with its combination of large flowers, long pedicels and slender young pods) representing the tetraploid, that few qualms about accepting Boreau's interpretation need be entertained.

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[*] E. Regel in *Izv. Imp. Obshch. Lyub. Yestestv., Antropol. i Etnogr.* (*Bull. Imp. Soc. Amat. Nat. Hist., Anthropol. & Ethnogr.*), **34** (2), 5 (1882).

[†] Almost exactly the range given by Irmisch and Glück (see Appendix, *infra*, p. 43), *ll.cc.*

DISTRIBUTION

In addition to the countries cited by Lipsky (*l.c.*), specimens from the following (besides Great Britain) are represented in Herb. Kew. and Herb. Mus. Brit. :—

SWEDEN. In rivulo pr. Visby Gott. rarius, Jul. 1868, *F. Ahlberg.*

SPAIN. " In rivulis totius Castellae, Aprili ad Septemb. ", *Herbarium Graelsianum.* Prov. Teruel, Moscardon, prairies tourbeuses, sur le calcaire, 1600 m., rare, Juin 1894, *E. Reverchon* 944 (as *N. officinale* " forma *microphylla* Reichb. ", det. O. Debeaux).

AUSTRIA. Styria, Cilli, 12 June 1842, *Alexander Prior.*

AFGHANISTAN. Sir-i-Chushma, 27 Aug. 1839, *Griffith* 1463. Kurrum Valley, wet land, meadow near Péwárkotal, profuse, 26 July 1879, *Aitchison* 894.

ERITREA. Aïderesó, 1245 m., 6 avril 1892, *Schweinfurth & Riva* 1455.

KENYA. Stream-edge, Limuru, 2100 m., Feb. 1915, *Dümmer* 1517.

UGANDA. Toro, 1500 m., 1905, *Dawe* 661. In running water, Fort Portal, Toro, 1500 m., 12 April 1906, *Bagshawe* 969.

SOUTH AFRICA. C. B. S., *Herb. Cayley* (*ex Herb. Benth.*, 1854) ; C. B. S., *ex Herb. Harvey* 566 (*ex Herb. Hook.*, 1867). Cape of Good Hope, 1771, *Banks & Solander.* Somerset East : in rivulis ad ped. Montis Boschberg, Nov. 1871, *Herb. MacOwanianum Austro-Africanum* 1233.

CANADA. Lake Region and Ontario, 16 Aug. 1877, *Macoun* 137. In creeks, London, Ontario, 7 June 1884, *Burgess* 114.

NEWFOUNDLAND. Eastern Avalon Peninsula, sandy and gravelly banks of Waterford River between Waterford Bridge and St. John's, in water, Aug. 1911, *Fernald & Wiegand* 5482.

U.S.A.—MASSACHUSETTS : Valley of the Hoosic River, meadows and swales near the river, North Adams, 25 June 1913, *Fernald & Long* 9553. CALIFORNIA : Jonesville, Butte County, in very cold spring creek in shade ; less frequent in the sun ; in appearance, native ; 1500 m., 15 July 1929, *Copeland* 368 (doubtful specimen) ; *sine loc. exact.*, *Dr. Coulter* (ex Herb. Coll. SS. Trin. Dublin) (doubtful).

SYNONYMY

It may be useful to conclude with a chronological list of the principal names here considered.

NASTURTIUM MICROPHYLLUM Boenninghausen ex Reichenbach, *Flora Germanica excursoria,* 683 (1832), et *Icones Florae Germanicae et Helveticae*, **2**, t. 50, fig. 4360 (1837-8).

??N. OFFICINALE var. PARVIFOLIUM Petermann, *Flora Lipsiensis excursoria*, 482 (1838).

N. FONTANUM (Lam.) Aschers. var. LONGISILIQUA Th. Irmisch in Mohl u. Schlechtendal, *Botanische Zeitung*, **19,** 317 (1861).

DICTYOSPERMA OLGAE Regel in *Izvestiya Imperatorskago Obshchestva Lyubitelei Yestestvovaniya, Antropologii i Etnografii*, **34** (2), 5 (1882). (Sep. title: Fedchenko, *Puteshestvie v Turkestan*, vyp. 18, tom III, Botanicheskiya Izsledovaniya).

PIREA OLGAE (Regel) Th. Durand ex Prantl in Engler u. Prantl, *Natürl. Pflanzenfam.* III, **2,** 183 (1891).

(?) RORIPA NASTURTIUM (Moench) Beck var. MICROPHYLLA (Boenningh. ex Reichb.) Beck, *Flora von Nieder-Österreich*, **2** (1), 464 (1892).

N. OFFICINALE var. OLGAE (Regel) Bush in Kuznetsov, Bush et Fomin, *Flora Caucasica critica*, **3** (4), 323 (1909).

?? N. PARVIFOLIUM (Peterm.) "Petermann" ex Howard et Manton in *Annals of Botany*, new series, **10,** 11 (1946), *in obs.*

N. UNISERIATUM Howard et Manton, *l.c.* 11–12 (1946).

APPENDIX: IRMISCH'S PAPER ON THE WATERCRESSES (1861).

An extremely important paper which has been apparently overlooked in this enquiry*, though not affecting the nomenclature on the specific level, is that by Thilo Irmisch, " Ueber zwei Varietäten der Brunnenkresse ", in Mohl & Schlechtendal's *Bot. Zeit.* **19,** 316–19 (1861). It is considered worth while to give the translation which follows. Irmisch distinguished the two forms as *N. fontanum* (Lam.) Aschers., vars. *brevisiliqua* and *longisiliqua*, respectively, and it will be seen that there were few aspects of their economy, except the cytological, which he did not investigate.

ON TWO VARIETIES OF THE WATERCRESS

by TH. IRMISCH

" It is well known that several varieties of the watercress (*Nasturtium fontanum* [Lmk.] Aschers., *N. offic.* R. Br.), based on the size and shape of the leaves, have been distinguished, which are indeed sometimes accorded the rank of species, but apparently little attention has been paid to the variations exhibited by the fruit. Already a great many years ago I found, not far from Sondershausen, in marshy places in one of the few meadows left to us, two variations strikingly aberrant in fruit characters and immediately distinguishable by them. I have [p. 317] recently investigated them afresh and consider them not unworthy of description.

" In the one variation, which I call var. *longisiliqua*, the ripe siliqua when ready for dehiscence measures, together with its pedicel, 1 in. to 1 in. 7 lines.[1] Of this length generally ⅓ belongs to the pedicel and ⅔ to the siliqua. Thus I found, in the great majority of examples, that the ripe siliqua measured 1 in. and its pedicel ½ in. ; in other cases the length of the siliqua amounted to 1 in. ½ line, that of the pedicel 6½ lines; sometimes, however, the pedicel is relatively shorter : siliquae measuring 9 or 10½ lines had pedicels of only 3 lines.

" In the other form, which I call var. *brevisiliqua*, the length of the ripe siliqua and its pedicel together, from numerous measurements, comes to 7½–9 lines : of this 3–4½ lines belongs to the pedicel and 4½–6 to the siliqua. The proportion of the latter to the former is not constant, since one finds, for example, with a length of 4½ lines for the siliqua a length of 4½ or even 3 for the pedicel, and with a siliqua length of 6 lines a pedicel length of 3 ; sometimes also the pedicel is somewhat longer than the siliqua.

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* I find, however, that it is cited by Arber in *New Phytol.* **30,** 189, 203 (1931).

[1] [N.B.—1 inch=c. 25 mm. ; 1 line=c. 2 mm.].

" Associated with the difference in the length of the siliquae is a similar difference in their breadth in these varieties, so that var. *longisiliqua* has narrower siliquae than var. *brevisiliqua* : in the latter the greatest breadth of the ripe siliquae is 1⅓ line, in the former ⅞–1 line. These differences are slight in themselves, but in association with the difference in the length of the siliquae they enhance the different appearance of the latter in the two varieties. In thickness I found no marked distinction, and precisely on this account the pods of var. *brevisiliqua* appear more flat and those of var. *longisiliqua* more cylindrical. The persistent style of the former is, relatively to the breadth of the whole siliqua, slightly broader than that of var. *longisiliqua.* The number of seeds in each valve in var. *brevisiliqua* is 12–20, in var. *longisiliqua* 20–25 ; in the former, however, frequently a number of seeds abort and the valves consequently present an uneven [bumpy] appearance. The size of the ripe seeds I found to be the same in both, likewise their colour : when they fall out of the ripe fruit they are yellow ; when older they become somewhat browner. On the other hand I could always recognise that the fine network of ridge-like projections on the testa had coarser meshes in var. *brevisiliqua* than in var. *longisiliqua.* Whereas I counted 6–7 meshes in a row on one face of the seeds of the former, in the latter I counted mostly twice as many.

" The flowers in var. *longisiliqua* are somewhat larger, and the anthers somewhat longer, than in the other, if one compares them from flowers of as near as possible equal development. The anthers in both are yellowish and the filaments later turn violet.—Certainly the raceme in var. *longisiliqua,* at the time when the lower fruits begin to ripen and there are only a few flowers at the tip of the inflorescence still bearing sepals and petals, is mostly a span long or even more, whereas in var. *brevisiliqua* it is scarcely as long as the middle finger or only slightly longer, but there is considerable variation in this.

" In other respects I found no difference between the two : they have the same caespitose growth, the same leaf forms, both are glabrous (though there are short hairs on the upperside both of the petioles and pedicels, especially noticeable in var. *brevisil.*) ; they both flower from spring until late in the autumn.* Both grow in one meadow, mostly in separate clumps, more rarely intermingled. I have repeatedly been able to satisfy myself that the shoot which had arisen from the axil of the uppermost leaf below a fruiting raceme and later, after it had borne a larger number of leaves, once more terminated in a flowering raceme, retained the fruit-form of the preceding generation.

" I have no doubt that, in view of the complete agreement of the two varieties in their vegetative organs, transitions will occur in regard to the distinctions here emphasized ; but I have not yet observed any such with us, which is perhaps due merely to the restricted distribution which the plant has with us.

" On the germination and rooting of the watercress reference should be made to my remarks in this magazine for the year 1857, no. 27.† " [Vide *Bot. Zeit.* **15,** 449–453, footnotes (1857).] " The two varieties agree in these respects.

" Which [p. 318] of the two varieties is the more common elsewhere, or whether they both occur (as here) equally commonly, I am unable to state. I incline to think, however, that var. *brevisiliqua* is the commoner. Linné places his *Sisymbrium Nasturtium aquaticum* at the head of the first division, *siliquis brevibus,* and the synonym *Sisymbrium Cardamine,* cited by him from Leonhard Fuchs, is, according to the accompanying figure (under 413 of the German folio edition), also referable to the short-fruited variety.‡ From this I must suppose that Linné had before him the short-fruited form. The same can be presumed from the words *siliquis pedicellum subaequantibus* adopted by other authors in their diagnoses of *Nasturt. offic.,* for they agree well with the var. *brevisiliqua,* but not with var. *longisiliqua.* I have the latter in my herbarium from the Golden Plain, where it occurs near the Numburg, and also from the Berlin flora.—The examples of *Nasturt. siifolium* which I have from the Dresden flora, all belong, that is to say as far as they possess better-developed fruits, to the short-fruited form.—In the *Fl. Excurs.* p. 683, Reichenbach refers under *N. microphyllum* to a *N. turfosum* Kz., which comes from Chile, and differs from the former, to which it stands nearest, in having a *siliqua elongata.* Unfortunately I have been unable to learn anything further about this Chilean plant, but since the watercress, with its in any case very wide distribution, also occurs in Chile, as I see from a quotation from Cl. Gay's *Flora Chilena* in an article by Chatin on the watercress, published in *La Belg. Horticole*, 1858 [*recte* 1859], p. 19, it would not be surprising if *N. turfosum* were identical with the var. *longisiliqua*.

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* "Rob. Brown says (*Vermischte bot. Schriften V.* 51) : 'fl. a Majo in Julium,' which is too short.

† "To the Cruciferae with adventitious shoots regularly occurring on the roots, enumerated *l.c.,* I can now add a few that I have since investigated more fully . . . . " [long footnote, not relevant to *Nasturtium officinale*].

‡ "The illustration which Dodonaeus gives in the 1616 edition, and which represents the watercress on a reduced scale, I should be inclined to refer rather to the long-fruited form, from the proportion of the siliquae, which are designated as *tenues* and *oblongae,* to the pedicels.

" I should like to remark further that the Watercress, in both its varieties, is very liable to various kinds of abnormalities in its inflorescence[1]. On a couple of walks I found the following monstrosities. Beneath the lowermost flower, or beneath one of the lowest flowers, there very frequently occur leafy bracts, which are generally adnate to the stem for a distance.* Often such a bract occurs only beneath a flower placed higher up on the axis of the raceme.—It likewise no less frequently happens that the raceme-axis grows out from the apex and there bears small foliage leaves, from the axis of which issue short branchlets mostly commencing with simple leaves.—Sometimes there occurs on the raceme-axis, after it has borne several normal flowers, a leaf (or 2 or 3 leaves) bearing in its axil a leafy shoot ; after which further pedicels occur on the raceme-axis.†—There was a very remarkable case where a lateral fruit occurred, below a fruit from beneath which the other flower-parts had already long fallen : it had a 2–3 line long pedicel and this was situated over the place where one of the two lower or lateral sepals had been, the scars of which were still recognizable. There could be no doubt concerning the situation, since the pedicel of the fruit belonging to it stood opposite a valve of the primary siliqua. The valves of the former stood at right angles to those of the latter. I have observed this case on three occasions. Once indeed I saw two accessory fruitlets, one on each side of the primary fruit. One would suppose that the lower sepals have here taken over the rôle of bracts. I have previously seen a similar phenomenon in other Cruciferae, but have not satisfied myself sufficiently on the insertion and situation of the accessory fruits.—Twice I have observed a lateral sepal that had become leafy and had persisted thus below the ripe fruit.—Above the pedicel of certain fruits, in the axil which this forms with the raceme-axis and from which accessory roots sometimes spring, I found a small bud, apparently the rudiment [primordium] of a flower. This situation is unusual in that the accessory buds in our plant are inferior in the axil of foliage leaves.

" Sondershausen, September 1861. "

Despite this very careful and detailed account, Irmisch's two varieties are referred to only very cursorily in most German floras. The least perfunctory treatment seems to be that by Glück in Pascher, *Die Süsswasser-Flora Mitteleuropas*, **15**, 268 (1936), where some measurements are given : var. *brevisiliqua*, with "small short fruit," 5–7.5 mm. long, 1.5–1.8 mm. thick, pedicel 4–6 mm. long (showing considerable differences from Irmisch's figures) ; var. *longisiliqua*, 17–25 mm. long, 1.2–2 mm. thick, pedicels 8–14 mm. long (agreeing with Irmisch). It seems possible, however, that the var. *brevisiliqua* as defined by Glück may be the triploid hybrid, *N. microphyllum* × *N. officinale* (i.e., *N. uniseriatum* × *N. officinale* in Howard & Manton's terminology), and not *N. officinale* itself, as the hybrid is characterized by its very short fruits. This triploid hybrid is quite a common member of the flora of N. Europe, and is also cultivated —*cf.* Howard in *Agriculture*, **53** (10), 453–6, c. tab. & fig. (1947).

SUMMARY

Attention is drawn to some probable earlier synonyms of *Nasturtium uniseriatum* Howard et Manton. The earliest of these, probably providing the valid name for the species, is *Nasturtium microphyllum* Boenninghausen ex Reichenbach (1832). Evidence in favour of this is the large flowers,

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[1] [Cf. Arber in *New Phytol.* **30**, 184–195 (1931) ; Halket in *op. cit.* **31**, 284–6 (1932).]

* "This case was also observed by Wydler, cf. *Flora* 1859, p. 297.—At the base of the pedicel of *N. font.* I also saw the rudimentary bracts, the common occurrence of which in the Cruciferae has been noticed by Norman in his learned paper : Quelques observations de morphol. végét., etc. " [Vide J. M. Norman in *Ann. Sci. Nat.*, Sér. 4, **9**, 105–141 (1858).]

† " In *Sinapis arvensis* I found another case : the raceme-axis, after bearing a few single flowers, produced a small lateral flowering-raceme (the axis of which had no leaf below the flowers) ; sometimes this lateral raceme was situated in the axil of a foliaceous mother-leaf, sometimes the latter was absent.

long pedicels and slender young pods shown in Reichenbach's figure, and the interpretation of *N. microphyllum* in this sense by French botanists from Boreau (1857) onwards. It is recommended that the tetraploid watercress be known as *N. microphyllum* Boenningh. ex Reichenb., *sensu* Boreau (1857), pending definite evidence to the contrary.

Should *N. microphyllum* be shown to be a form of the diploid watercress, *Pirea olgae* (Regel) Durand ex Prantl (*Dictyosperma olgae* Regel, 1882), which certainly represents the tetraploid, will provide the earliest specific epithet for the latter.

A list is given of localities for the tetraploid, from Europe, Asia, Africa and North America, additional to those cited by Lipsky (1900).

A translation of an important paper by Th. Irmisch (1861), containing much biological and morphological information on the watercresses, and providing, in *N. fontanum* var. *longisiliqua* Irmisch, the earliest certain varietal name for the tetraploid, is appended.

A probably natural hybrid in Hymenocardia Tul.

Investigation by Miss E. A. Bruce and the writer of some puzzling gatherings of *Hymenocardia* collected in Sierra Leone by Mr. F. C. Deighton has revealed the occurrence of what are in all probability natural hybrids. At Mano Bonjema, Mr. Deighton informs us, *H. lyrata* Tul. and *H. heudelotii* Muell. Arg. were growing commonly all mixed together. From among them was collected Deighton 3710 which, on examination at Kew, appeared intermediate beween the two species, and hybrid origin was suspected. The leaves of this gathering are shaped somewhat like those of *H. heudelotii* but are more acuminate than is normal in that species, whilst the fruit has the broad outline of that of *H. heudelotii* combined with the conspicuous wings of *H. lyrata.*

A second gathering (Deighton 3185) from a different locality, Mano (Luawa), also appears to be a hybrid. It has the leaves of *H. lyrata* and fruits similar in proportions to those of Deighton 3710 but smaller, and with a strong tendency to unequal development of the wing, a character likely to have been derived from *H. heudelotii,* the fruits of which are practically wingless.

Mr. Deighton, when informed that it was suspected that these two gatherings of his might be hybrids, replied " I certainly suspected that my 3710 was a hybrid when I collected it. . . . . . My 3185 looks very similar, and the road through Mano (Luawa) runs close to a big river." Mr. Deighton informs me that *H. lyrata* is the abundant forest tree in the south of Sierra Leone, extending to the north in riverine forest, whilst *H. heudelotii* is common in wetter places in the south and along river banks throughout the country.

The writer would be glad to receive information regarding any suspected occurrence of hybridity in *Hymenocardia* from Sierra Leone or elsewhere in Africa, especially between either of the above species and *H. acida* Tul.

E. MILNE-REDHEAD.

THE GENUS CHONEMORPHA G. DON (APOCYNACEAE).

D. CHATTERJEE.

The earliest plant referable to the genus *Chonemorpha* was found in Rheede's Hortus Malabaricus **9** (1689), 7, tab 5 and 6 under the only name "Belutta-Kaka-Kodi." In 1812, M. R. Smith from Sylhet, Assam, sent to the East India Company's Botanic Garden in Calcutta a plant or plants known as "Harkee" in Bengali. This was a climber with sweet-scented white flowers. Roxburgh flowered this and left a drawing. He described it as *Echites macrophylla*,[1, 2] and identified it as the same as Rheede's figure (l.c). In 1837 G. Don proposed the genus *Chonemorpha*,[3] from the funnel-shaped corolla of this and some other plants. He included a number of species under this new genus but all of them are not really referable to it as is shown at the end of this paper. Horsefield was in Java at this time and found and figured a similar plant (no. 476 of his collection of drawings at Kew). The figure agrees with his plant no. 259 from Java in the Kew Herbarium. Miquel called Horsefield's plant *Chonemorpha mollis*.[4] Wallich's Catalogue refers to a number of *Echites* which are nothing but *Chonemorpha macrophylla* (Roxb.) G. Don (Wall. Cat. 1656, 1657, 1658). In 1911, Ridley[5] proposed the name *C. rheedii* for the Ceylon plant and the name *C. penangensis*[5] for a Malayan plant of the same genus. But in 1923 Gamble[6] regarded the Ceylon and South Indian specimens as the same as Wight's Icones copying of Roxburgh's drawing of the Sylhet plant.[7]

A number of new species have been described from West China, French Indo-China, and the Malay Islands during the past forty-five years, and it is now possible to get a better idea of the genus as a whole than it was prior to 1900. Unfortunately no one has attempted a review of the group excepting Furtado[8] who has dealt with only four or five species. Of these *C. fragrans* (Moon) Alston and *C. mollis* Miq. have been reduced in this paper to *C. macrophylla* (Roxb.) G. Don, and it is very doubtful whether *C. assamensis* is distinct from *C. macrophylla*.

While working out some sheets of *Chonemorpha* in the Kew Herbarium it was found necessary in view of ampler herbarium materials to differ considerably from Furtado's fragmentary review (l.c.), and it was thought that a review of the genus as a whole should be attempted. I regret I could not see four species (*C. assamensis*, *C. eriostylis*, *C. graciliflora* and *C. yersini*) of the genus, but I have indicated my remarks against each of these in the enumeration.

A Key to the other species is as follows and it is hoped that the species not seen by me may also be fitted in the proposed Key without changing the general plan very much.

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[1] Roxb. Hortus Bengalensis, 20 (1814).
[2] Roxb. Flor. Indica **2**, 13 (1832).
[3] Don. Gen. Syst. **4**, 76 (1837).
[4] Miq. Flor. Ind. Bat. **2**, 444 (1856).
[5] Agri. Bull. Str. & Fed. Mal. States **10**, 146–48 (1911).
[6] Flor. Madras **2**, 818 (1923).
[7] Wight Icones, 432 (1843)
[8] Gard. Bull. Str. Settlements **9**, 113-117 (1935).

Key to the species of *Chonemorpha* examined.

Calyx with a distinct tube	
Corolla tube long 4–5 cm.	**grandeareana** (5)
Corolla tube shorter than 4 cm.	
Calyx tube shorter than the lobes ..	**macrantha** (7)
Calyx tube equalling or longer than the lobes	
Calyx tomentose	
Tube 20 mm. inflated, inflorescence rhachis hirsute ..	**megacalyx** (9)
Tube 8–14 mm., cylindrical	
Mouth of open corolla 5 cm. in diam.	**penangensis** (10)
Mouth of open corolla 2·5 cm. in diam. ..	**splendens** (11)
Calyx glabrescent	
Leaves elliptic, base distinctly cordate	**elliptica** (2)
Leaves broadly ovate, base not cordate	**macrophylla** (8)
Calyx deeply 5-partite	
Lobes broadly lanceolate, imbricate, climber	**griffithii** (6)
Lobes narrow conical, valvate, shrub ..	**valvata** (12)

ENUMERATION.

1. **Chonemorpha assamensis** *Furtado* in Gard. Bull. Str. Settlements **9,** 115 (1935). I have not seen the type. The original description (l.c) is very meagre. The plant differs from *C. macrophylla* as stated in the text in having a shorter and glabrous calyx. I have seen two sheets of *C. macrophylla* from Lushai Hill, Assam (*Mrs. Parry* 333), where the calyx has a structure similar to that stated by Furtado as occurring in his species *C. assamensis*. I do not consider Mrs. Parry's sheet different from *C. macrophylla* and I have my doubts whether *C. assamensis* can have an independent existence on the characters stated unless supported by other distinct characters. It may ultimately prove to be just a variation of *C. macrophylla.*

2. **Chonemorpha elliptica** (*Blanco*) *Merrill et Rolfe* in Philipp. Journ. Sci. **3,** 121 (1908). *C. blancoi* Merrill in Enum. Philipp. Fl. Plants **3,** 335 (1923). *C. macrophylla* Vidal non G. Don Cat. Pl. Prov. Manila 36 (1880). *Tabernaemontana elliptica* Blanco in Fl. Filip. 115 (1837) non Thunb. This species is endemic in the Philippines. The leaves are elliptic and with cordate base. It resembles *C. macrophylla* in having a glabrescent calyx but the flowers are much smaller.

DISTRIBUTION. Philippine Islands : Luzon, Manila, *Vidal* 3265 ; *Loher* 3881 ; Rizal, *Merrill* 2704 ; *Maximo Ramos* 1065 ; *Merrill* 482.

3. **Chonemorpha eriostylis** *Pitard* in Flor. Gen. Indo-Chine **3,** 1247 (1933).

This appears to be a good species but I have not seen any specimen.

DISTRIBUTION. Indo-China : Annam.

4. **Chonemorpha graciliflora** *Pitard* in Flor. Gen. Indo-Chine **3,** 1248 (1933).

I have not seen the type but from the description I am convinced it is a good species.

DISTRIBUTION. Indo-China : Laos.

5. **Chonemorpha grandeareana** *Pierre ex Spire* in Planch. Prodr., 296 (1894), nomen ; Spire, Caout. Indo-Chine, 72 (1906) ; Flor. Gen. ndo-Chine **3,** 1252 (1933) ; Flor. Siam. Enum. **2,** 474 (1939).

This is a species with very long corolla tube. The plant is distinct in the genus because of this character and can be easily identified in the Herbarium.

DISTRIBUTION. Indo-China ; Annam, Laos. Cochinchina. Siam.

6. **Chonemorpha griffithii** *Hook. f.* Flor. Brit. Ind. **3,** 662 (1882). This is also a very distinct species of the genus and is found in East Himalaya and Assam. It differs from almost all other species in having a 5-partite calyx in distinction from others where the calyx has a distinct tube. This peculiar calyx was noticed in Hooker's description and he doubted whether this species can remain in the genus.

I have examined most of the species belonging to *Chonemorpha* and find that the *calyx* is very variable in this genus, and extreme and intermediate forms occur. The calyx is deeply 5-partite and *valvate* in *C. valvata.* It is 5-partite and *imbricate* in *C. griffithii.* The next stage, where a short and distinct calyx tube is formed, is seen in *C. macrantha.* In *C. megacalyx* the tube is best developed, and is united and about 20 mm. long but with distinct lobes. Lastly in *C. penangensis* the tube is so well developed that the calyx lobes are almost reduced to small teeth-like structures. In view of such a variation *C. griffithii* may well remain in the genus.

DISTRIBUTION. East Himalaya. Sikkim : Permeakley, *T. Anderson* 837 ; *T. Anderson* 302 (2 sheets) ; Kurseong, *C. B. Clarke* 28094, 11782A ; Kurseong, *Gamble* 3221 A & B ; Rungoo Valley, *Gamble* 793A ; Pateabong, *Gamble* 8209.

Assam : Khasia, *Griffith,* without number ; *Simon* 60 ; Naga Hills, Kilomi, *N. L. Bor* 4489.

7. **Chonemorpha macrantha** *Pitard* in Fl. Gen. Indo-Chine **3,** 1249 (1933) ; Craib in Flor. Siam. Enumer. **2,** 474 (1939).

This is a species with short but distinct calyx tube. It approaches very closely *C. valvata* where the calyx tube is absent.

DISTRIBUTION. Indo-China. Siam. S.W. China : Yunnan, *Forrest* 24368 (new record).

8. **Chonemorpha macrophylla** (*Roxb.*) *G. Don* in Gen. Syst. **4,** 76 (1837). DC. Prodrom. **8,** 430 (1844) ; Miq. Fl. Ind. Bat. **2,** 444 (1856) ; Hook. f. Flor. Brit. Ind. **3,** 661 (1882) ; Trim. Flor. Cey. **3,** 138 (1895) ; Kurz For. Fl. Brit. Burma **2,** 187 (1877) ; Gamble Trees etc. of Darjeeling 56 ; Wight Icones Pl. Ind. Or. 432 (1843) ; King & Gamble Mat. Flor. Mal. Penin. **4,** 693 (1907) ; Gamble Flor. Madras 818 (1923) ; Furtado in Gard. Bull. Str. Settlements **9,** 115 (1935).

C. macrophylla var. *grandis* A. DC. Prodrom. **8,** 450 (1844). *C. fragrans* (Moon) Alston in Annal. Roy. Bot. Gard. Peraden. **11,** 203 (1929) ; Gard. Bull. Str. Settlements **9,** 115 (1935). Flor. Ceylon **6,** 192 (1931) ; Kandy Flora 47 (1938). *Chonemorpha fragrans* (Moon) Alston is the same plant as *C. macrophylla* (Roxb.) G. Don as shown by Alston in Flor. Cey. **6,** 192 (1931), and cannot be kept separate as proposed by Furtado (l.c.). This is clear from the examination of herbarium material and also the synonymy given by Alston in Flor. Ceylon (l.c.). It remains to determine which of the two is the correct name. Moon's " Catalogue of Indigenous and Exotic plants of Ceylon " was published after June 1824 and not in 1821 as stated in Flor. Ceylon (l.c.). Roxburgh's Flora Indica Vol. **2** was published in March 1824. Unfortunately, following Alston's synonymy (l.c.), I could not find the description of *Echites macrophylla* in the 1824 edition of Vol. **2,** 13. The description of Roxburgh's plant appears in the second edition of Flora Indica Vol. **2,** 13, published in 1832. Carey in the preface of the second edition says that the edition is a reprint of the first edition of 1824. I do not know whether Alston made a mistake in quoting 1824 for 1832 in his synonymy for *C. fragrans* (l.c.) or assumed the first date (1824), as the second edition was just a reprint of the first edition. Even on this assumption (which I very much doubt) *Echites macrophylla* Roxb. has a priority of about three months over *Echites fragrans* Moon (nomen nudum)—both being published in 1824. *C. rheedii* Ridley in Agric. Bull. Str. & Fed. Mal. States **10,** 146 (1911). *C. mollis* Miq. in Flor. Ind. Bat. **2,** 444 (1856) ; Kurz Journ. As. Soc. Bengal **46,** 257 (1877) ; Furtado Gard. Bull. Str. Settlements **9,** 116 (1935), p.p. *C. maerophylla* Kurz in Journ. As. Soc. Bengal **46,** 257 (1877). The specific epithet is evidently a printing mistake for *C. macrophylla*. *Echites macrophylla* Roxb. in Hort. Bengalensis 20 (1814), nomen ; Flor. Indica **2,** 13 (1832), descript. ; Wall. Cat. 1657 non *Echites macrophylla* H. B. K. in Nov. Gen. et Spec. **3,** 218 (1819). This last is a different plant from South America and is nothing but *Mandevilla hirsuta* (A. Rich.) K. Schum. *E. elegans* Wall. Cat. 1656, nomen. *E. grandis* Wall. Cat. 1658, nomen. *E. latifolia* Wall. Cat. 1657, nomen. *E. fragrans* Moon Cat. 20 (1824), nomen nudum. " Belutta-Kaka-Kodi " Rheede in Hort. Malabaricus **9,** 7, tab. 5 & 6 (1689).

DISTRIBUTION. India. East Himalaya. Sikkim : *Hooker* ; *T. Anderson* 307. North Bengal : Tindheria, *Gamble* 3223A, 32238 ; Buxa Bedul (?), *Gamble* 7698 ; Rungoo Valley, *Treutler* 144 ; Duars, Muraghat Forest, *Haines* 5727. Assam : Sylhet, *Wall. Cat.* 1657 (type !) ; *Jenkins ; Hooker* 1618 ; Lushai Hills, *Mrs. Parry* 333 (2 sheets). West Himalaya : Kumaon, *Wall. Cat.* 1558 : Kumaon, *Falconer ;* Mahargiri, *Strachey et Winterbottom ;* Sarjee Valley, *Duthie* 5769. Bombay : *Dalzell ;* N. Kanara, *Sedgewick and Bell* 6051, 3960 ; Gudehalli, Karwar, *Sedgewick and Bell* 6792. South India : Courtalum, *Wall. Cat.* 1656 ; *Wight* 1880 (2 sheets). Canara, *Hohenacker* 158 ; *Wight.*

Ceylon : *Mackenzie ; Mrs. Walker.*

Burma : Lashio, *Lace* 5838 ; Maymyo, *Lace* 6179 ; Rangoon, *McClelland ;* Moulmein, *Parish.*

Andamans : Winkeolegang, *Parkinson* 619. South Andaman, *Kurz* 1842.

Malay Peninsula: Perak, *Ridley* (type of *C. rheedii*).

Java : *Horsefield* 259 ; *Zollinger* 814 ; Buitenzorg, *Bakh* 7738 ; *Koorders* 20353B.

9. **Chonemorpha megacalyx** *Pierre* in Spire Caout. Indo-Chine, 75 (1906) ; Flor. Gen. Indo-Chine **3,** 1250 (1933). This is a species with the longest calyx tube and hirsute inflorescence rhachis.

DISTRIBUTION. Indo-China: Laos, *Spire* 17. S.W. China: Yunnan, Szemao, *Henry* 12103; 12103A (new record !).

10. **Chonemorpha penangensis** *Ridley* in Agric. Bull. Str. & Fed. Mal. States **10,** 147 (1911). Flor. Mal. Penin. **2,** 360 (1923). Gard. Bull. Str. Settlements **9,** 116 (1935). This is a species with long hairy calyx and very short teeth-like lobes.

DISTRIBUTION. Malay Peninsula : Penang, *Curtis* 832 (co-type !) ; Malay, *Maingay* 1074, 1725 ; Pahang Kota Tongkat, *Evans*.

11. **Chonemorpha splendens** *Chun et Tsiang* in Sunyatsenia **2,** 157 (1934). This is a species with smaller flowers and very long acuminate tomentose follicles.

DISTRIBUTION. China : Hupeh, Hainan, *C. Wang* 33364 (type !) ; Hainan, Dung Ka to Wen Fa Shi, *N. K. Chun & C. L. Tso* 43838.

12. **Chonemorpha valvata** *Chatterjee* sp. nov. ; *Chonemorpha macranthae* Pitard arcte affinis sed pedunculis longioribus, calyce 5-partito segmentis fere liberis valvatis brevioribus angustioribusque differt.

Shrub 2-3 m. *Stem* terete rusty tomentose specially on the younger parts and undersurface of leaves, rugulose with lenticel scars. *Leaves* opposite, petioled, broadly ovate-elliptic, apex variable, usually shortly acute to subobtuse, base narrow to rounded, midrib entire, channelled and hairy above, slightly raised below, midrib and primary veins often of darker colour, primary veins 7-9 pairs diverging from the midrib at regular intervals with slight tendency to form loops near the margin, lamina subcoriaceous and densely tomentose on the lower surface, glabrescent on the upper, 20-25 cm. long, 10–14 cm. wide ; petiole 2–3·5 cm. long, thinly rusty tomentose. *Inflorescence* on long peduncle, 14–20 cm. long, few- to many-flowered, corymbose in the last quarter ; a number of narrow conical to lanceolate bracts 10-12 mm. long are present at the base of the corymbose structure as well as at the base of pedicels ; bracts softly tomentose on both surfaces. *Flowers* large, fleshy, lake purple, with white inside the tube ; fragrant, hypocrateriform, mouth 6–7 cm. in diam., corolla lobes slight and gently twisted to the left in bud. *Calyx* 5-partite ; lobes narrow conical, valvate, thinly pubescent outside, glabrous within, notveined, 12–13 mm. long 2–3 mm. wide, acute to acuminate with 5 irregularly semicircular glands near the base inside, margins of glands undulate. *Corolla* tube slightly inflated near the base, narrower in the middle, 7 cm. long in bud including lobes about 3 cm. in diam., lobes obliquely obovate, glabrous papery, thinly but distinctly multinerved, margin subentire. *Stamens* 5, short, included within the tube, epipetalous, attached to the tube near the base ; anthers long sagittate, tapering gradually from the base to an acuminate apex, introrse, 11 mm. long ; filaments flat, short convex, bristly, almost closing the cavity of the tube by their convex surfaces, except for a small space near the centre through which the style passes. *Carpels* 2 ; ovaries glabrous, free, but style and stigma united ; style and stigma covered within the dome formed above them by the 5 introrse anthers ; style filiform, glabrous except near the top below the stigma where it is thinly hairy ; stigma flattened and circular, plate-like with a central broadly conical rugulose bifid structure with a constriction between the two parts ; ovary with style and stigma about 16 mm. long. *Disc* cupular, entire, glabrous.

DISTRIBUTION. Burma. Upper Burma, Mogok, 1,300 m., 13.6.1914, *A. Rodger* 120.

S.W. China : Yunnan, west of Tengyueh, 1,600 m., lat. 25° N., 5.1912, *G. Forrest* 7590 (type !) ; western flank of Tali Range, lat. 25° 40′, 8.1913, *G. Forrest* 11603 (2 sheets).

Siam : Doi Sutep, 1,700 m., 30.4.1931, *Mrs. Cunniff.*

C. valvata resembles *C. macrantha* but differs in being a shrub (*C. macrantha* is a climber) with 5-partite (almost free) calyx and longer peduncle.

13. **Chonemorpha yersini** *Vernet ex Spire* in Bull. Econ. Indo-Chine 859 (1902). Flor. Gen. Indo-Chine **3,** 1251 (1933). *C. harmandiana* Pierre in Planch. Prod. Apocyn. 296 (1894). I have not seen any specimen of this species.

DISTRIBUTION. Indo-China : Laos.

Doubtful and excluded species of *Chonemorpha.*

C. antidysenterica G. Don = **Holarrhena antidysenterica** (*Roth.*) *Wall. ex A.DC.*
C. bantamensis G. Don = **Ichnocarpus moluccanus** *Miq.*
C. blancoi Merrill = **Chonemorpha elliptica** *Merrill et Rolfe.*
C. convolvuloides G. Don = **Calonyction aculeatum** (*L.*) *House.*
C. coriacea G. Don = **Anodendron coriaceum** *Miq.*
C. cristata G. Don = **Aganosma marginata** (*Roxb.*) *G. Don.*
C. densiflora G. Don = **Ecdysanthera densiflora** *Miq.*
C. dichotoma G. Don = **Aganosma acuminata** (*Roxb.*) *G. Don.*
C. elastica Merrill = **Rhyncodia rhynchosperma** (*Wall.*) *K. Schum.*
C. fragrans (Moon) Alston = **C. macrophylla** (*Roxb.*) *G. Don.*
C. grandiflora G. Don = **C. macrophylla** (*Roxb.*) *G. Don.*
C. harmandiana Pierre = **C. yersini** *Spire.*
C. inflata G. Don = **Ecdysanthera inflata** (*Bl.*) *K. Schum.*
C. malabarica G. Don I do not know what plant Don had for this. I agree with Hooker F.B.I. **3,** 662 (1882) in excluding this from the genus.
C. mollis Miq. = **C. macrophylla** (*Roxb.*) *G. Don.*
C. mollissima Boerl. I could not place this in any genus. Boerlage's Flor. van Ned. Ind. **2,** 400 (1899) does not give a description of the plant.
C. nouettiana Pierre = **Nouettia cochinchinensis** *Pierre.*
C. pubescens G. Don = **Holarrhena antidysenterica** (*Roth*) *Wall. ex A.DC.*
C. rheedii Ridley = **C. macrophylla** (*Roxb.*) *G. Don.*
C. reticulata G. Don = **Cryptolepis buchanani** *Roem. et Schult.*
C. vestita G. Don = **Wrightia tomentosa** *Roem. et Schult.*

EMPOGONA HOOK. F. AND ITS RELATION TO TRICALYSIA DC.

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In 1871 Sir J. D. Hooker based his new genus *Empogona* on a plant collected by Kirk on the shore of Lake Nyasa in southern Nyasaland. This plant he named *E. kirkii.* When Hooker took up his genus again in his elaboration of the *Rubiaceae* for the " Genera Plantarum " in 1873 it was still monotypic. Additions to the genus were slow ; in 1887 an alleged variety—*glabrata*—of *E. kirkii* was described by Oliver, but it was not until 1900—nearly thirty years after the publication of *E. kirkii*—that a second species, *E. junodii*, was described by Schinz. Since then two further so-called species have been added —*E. allenii* Stapf in 1906 and *E. taylorii* S. Moore in 1925. Finally, in 1937, *E. kirkii* var. *australis* was described by Schweickerdt.

While examining some east tropical African *Rubiaceae*, the writer was struck by the remarkable similarity of the flowers of certain species, hitherto placed in *Tricalysia*, to those of *Empogona kirkii.* Further investigation only served to emphasise this affinity. It became therefore necessary to decide whether *Empogona* should be merged with *Tricalysia*, or whether *Empogona* should be retained as a distinct genus and certain species of *Tricalysia* transferred to it. For reasons to be dealt with later on, the writer is unable to uphold the distinctness of *Empogona.*

The affinity between the species of *Tricalysia* and *Empogona* has already been noticed by Baillon, who, in Adansonia **12,** 179-213 (1878); published a paper entitled " Mémoire sur les genres Canthium et Hypobath rum ". Only with the second part of this paper (that dealing with *Hypobathrum*) are we concerned here. Now *Hypobathrum* was based by Blume (Bijdragen tot de Flora van Nederlandsch Indië, 1007 : 1826) on *H. frutescens* Bl., a Javanese plant. Baillon (*l.c.*) took up Blume's genus, regarding it in a very wide sense indeed, including under it as subsections the following genera, among others : *Empogona*, *Feretia*, *Kraussia*, *Tricalysia*, *Zygoon*, etc. This view has not been adopted by subsequent writers—at least not by those dealing with the African genera concerned. K. Schumann in his treatment of the *Rubiaceae* (in Engl. et Prantl, Nat. Pflanzenf. **4,** pt. 4, 80 : 1891), restricts *Hypobathrum* to three species from the Malayan archipelago. Hooker's previous account in the " Genera Plantarum " also treated *Hypobathrum* in a restricted sense (this, however, was prior to Baillon's paper). Though these genera are doubtless very closely related, *Hypobathrum* appears to be separable from *Tricalysia* by the included anthers and the short, rounded corolla lobes, possibly also by the position of the placenta.

In Kew Bull. 1931, 254–257, Bullock revived *Kraussia* as a genus, separating it from *Tricalysia* principally by the form of the style, at the same time leaving in *Tricalysia* certain species that had previously been included in the section *Kraussia* of that genus. It is in certain species of this residue that the very strong affinity with *Empogona* is found.

Hooker originally separated *Empogona* from *Tricalysia* by the ecalyculate flowers and the form of the anthers; he originally described the anthers as sessile and this assertion is repeated in the "Genera Plantarum". The anthers are, however, not sessile, being dorsifixed and versatile and having a very short filament about 1.2 mm. long (in *E. kirkii*) attached to the anther at about ¼ the length of the latter above its base. A filament has been observed in all the species of *Empogona* and is visible on the type specimen of *E. kirkii* but, being behind the anther and often more or less concealed by the mass of woolly hair that covers the throat of the corolla, may be sometimes difficult to discern. Hiern is thus correct in describing (Fl. Trop. Afr. **3**, 115 : 1877) the anthers of *E. kirkii* as subsessile. Though in most species of *Tricalysia* the filaments are appreciably longer than those of *Empogona*, yet in various species (e.g. *T. reticulata* (Benth.) Hiern, *T. pobeguinii* Hutch. et Dalz.) they may be as short as 1.5 mm. The writer cannot consider that so slight a difference is of importance for retaining the two genera as separate. In *Empogona* a conspicuous dilated appendage is noticeable at the apex of each anther; this contrasts sharply with the muticous or minutely apiculate anthers of the majority of *Tricalysia* species. Even this character is, however, by no means constant. The length of the appendage is variable, even within the limits of *Empogona kirkii* itself; in *Tricalysia djumaënsis* De Wild. appendages of a similar shape to and as long as some seen in *Empogona* are combined with the comparatively long filaments and other characters of *Tricalysia*. The presence or absence of a calyculus is a further character upon which emphasis has been laid. In *Empogona* the bracteoles are normally separate and alternate, but sometimes may be subopposite or opposite, all three arrangements being present on the same shoot. In *Tricalysia ovalifolia* Hiern. which is unquestionably congeneric with *Empogona kirkii*, the bracteoles are sometimes opposite and connate into a cupule. The position of the bracteoles on the pedicel is variable. In *Tricalysia* the bracteoles are very commonly fused into the characteristic cup or calyculus embracing the base of the calyx, and this arrangement is certainly very different from that of *Empogona*. Unfortunately a well-marked calyculus is by no means always present in *Tricalysia*. The bracteoles may be opposite and free or connate only near the base, as in *T. macrophylla* K. Schum. In material of an apparently undescribed species of *Tricalysia* from the Gold Coast, the bracteoles are always free, and, it appears, indiscriminately alternate, subopposite or opposite. I have refrained from bringing forward in evidence the remarkable species *T. welwitschii* K. Schum. and *T. anomala* E. A. Bruce, which have the bracteoles subulate or linear-lanceolate and free or almost so; in no other characteristics do they show any close affinity with *Empogona*, and in facies they are very different both from *Empogona* and from the great majority of *Tricalysia*; it is probable that, when a complete revision of the latter difficult and widespread genus shall be made, it may be found desirable to separate generically these two species.

It has already been mentioned that in *Empogona* the throat of the corolla is concealed by a characteristic dense mass of woolly hair, upon which the anthers appear to sprawl. A similar development of indumentum is found in various species of *Tricalysia* (e.g. *T. coriacea* (Benth.) Hiern), though perhaps the mass is not quite so dense and protuberant as it is in

Empogona ; but the difference, if any, is of the slightest degree. Thonner (Flowering Plants of Africa, 526–7 : 1915) endeavoured to contrast the fascicled flowers of *Tricalysia* with *Empogona*, whose flowers were described as solitary or 2–3 together. This distinction is quite worthless and, in fact, non-existent, as the arrangement described for *Empogona* occurs not infrequently in *Tricalysia*, and the inflorescences in *Empogona* may be more than three-flowered. It is perhaps worth noting here in addition that the density of the inflorescence is subject to considerable variation in both genera.

Empogona is thus separable by no satisfactory character from *Tricalysia* and it seems impossible to maintain it as a distinct genus. Nevertheless, the species hitherto placed in *Empogona*, together with a few species of *Tricalysia* which are closely related, form a fairly well-defined group possessing several characters which are rare or sporadic in the rest of *Tricalysia*, where they occur separately in species showing in other ways no very close affinity to *Empogona*. Furthermore this group, as far as the inflorescence is concerned, possesses a common facies which, in the writer's experience, renders it easily separable from the rest of *Tricalysia*. The writer therefore proposes to regard this group as a section of *Tricalysia*, equivalent in rank to the other subdivisions of the genus enumerated by K. Schumann (in Engl. et Prantl, Nat. Pflanzenf. **4**, pt. 4, 81–2: 1891). This must not, however, be taken to imply that the writer is necessarily in agreement with the delimitation of K. Schumann's sections ; some of the characters employed are clearly most unsatisfactory, but the solution of these difficulties must await a full revision of the genus.

The new section is distributed through E., S. central and S. E. Africa, extending from Kenya in the north to Natal in the south. It appears, with the exception of the isolated occurrence in Sierra Leone of the somewhat doubtfully placed *T. reflexa* Hutch., to be quite absent from the great rain-forest area of W. and central Africa, where, however, numerous other species of *Tricalysia* occur. It almost certainly occurs in Madagascar ; one, at least, of the species mentioned by Baillon from this region, *Hypobathrum albicaule*, almost certainly belongs here. It is of interest that he remarks concerning this species (*l.c.*) : " Le nom générique adopté par Boivin [*Eriostoma albicaulis* Boivin ex Baill., *l.c.*, *pro synon.*] indique que la gorge de la corolle est tout obstruée de poils longs et serrés. Par là, et par ses divisions réfléchies, cette corolle est tout à fait celle de l'*Empogona*, plante absolument congénère de celle-ci ".

I am very grateful to the authorities at Kew and the British Museum (Natural History) for opportunities of examining material of this group ; my thanks are especially due to Mr. J. E. Dandy.

Tricalysia A. Rich. ex DC. Sect. **Empogona** (*Hook.f.*) *Brenan*, stat. nov.—*Empogona* Hook.f. in Hook. Ic. Pl. **11,** 72, t. 1091 (1871) ; Benth. et Hook.f., Gen. Pl. **2,** 94—95 (1873); Hiern in Oliv., Fl. Trop. Afr. **3,** 114—115 (1877) ; K. Schum. in Engl. et Prantl, Nat. Pflanzenf. **4,** pt. 4, 80 (1891). *Tricalysia* Sect. *Kraussia* K. Schum. *l.c.* 81, *p.p.*, non *Kraussia* Harv. Flores axillares, fasciculati vel laxiuscule cymosi (raro inflorescentiae uniflorae), distincte sed nonnunquam breviter pedicellati ;

bracteolae alternae, raro suboppositae vel oppositae, liberae vel rarissime connatae, nunquam calyculiformes ; fauces collorarum pilis lanuginosis densissimis exsertis obtectae ; filamenta staminum brevissima ; antherae apice longe appendiculatae.—Typus : *Empogona kirkii* Hook.f., non *Tricalysia kirkii* Hiern.

KEY TO THE SPECIES OF SECT. EMPOGONA OF CONTINENTAL AFRICA.

Plants evergreen ; leaves persistent until the twigs have become coated with bark, usually coriaceous or subcoriaceous when mature (sometimes firmly chartaceous), often comparatively large ; inflorescences borne in the axils of persistent leaves, but frequently also arising from the axils of fallen leaves on older twigs :

  Leaves very small, up to about 2·4×0·9 cm., glabrous or nearly so . . . . 4 *T. junodii* (Schinz) Brenan

  Leaves much larger, about 3–16·5×1·5–6 cm. (occasionally a few smaller depauperate leaves are present, but the normally developed mature leaves on the same shoot always exceed 3×1·5 cm.) :

    Leaves 3–10×1·5–4·5 cm. :

      Primary lateral nerves of leaves few, rather distant, in 4–6 pairs ; network of veins inconspicuous or scarcely visible on lower side of leaves ; mature leaves glabrous . . . . . 3. *T. sonderiana* Hiern

      Primary lateral nerves of leaves more numerous and closer together, in 7–11 pairs (rarely fewer in small leaves on abnormal depauperate shoots) ; network of veins frequently (though by no means always) visible on lower side of leaves and occasionally somewhat raised ; mature leaves glabrous, or occasionally slightly pubescent, very rarely densely pubescent . . . . . 2. *T. ovalifolia* Hiern

    Leaves 14–16·5×4–6·5 cm., glabrous, obtusely acuminate at apex, with 4–6 arcuate primary lateral nerves on either side of the midrib ; network of veins raised and prominent on both surfaces . . . . . 1. *T. reflexa* Hutch.

Plants deciduous ; leaves falling before the mature twigs have become coated with bark, usually chartaceous when mature (rarely subcoriaceous or coriaceous) ; inflorescences borne only on older twigs in the axils of fallen leaves, absent from axils of leaves of the current year . . . . . 5. *T. allenii* (Stapf) Brenan

(For varieties, see the following account under the respective species.)

1. **Tricalysia reflexa** *Hutch.* in Kew Bull. 44 (1915).

SIERRA LEONE. Kessewe, N. Niagi, 17 Apr. 1913, *C. E. Lane-Poole* 131 (type, Herb. Kew.) :—bush to small tree.

This is the only species of the section hitherto found in West Africa. Hutchinson suggested no affinity for his species, but its relationship with *T. ovalifolia* seems clear. It has by far the largest leaves of any species in the section. From *T. ovalifolia* it further differs in the fewer lateral nerves of the leaves and the form of the leaf apex ; and from *T. sonderiana* in the prominence of the vein-network beneath.

This species is also noteworthy in having but one ovule per loculus, suggesting relationship to *Coffea*, a genus with which it has otherwise very little affinity. Differences in ovule number, although much weight has been laid on them in the past, do not seem altogether satisfactory as generic criteria. Nevertheless, until more material, including fruit, of *T. reflexa* is available, its position must remain doubtful.

2. **Tricalysia ovalifolia** *Hiern* in Oliv. Fl. Trop. Afr. **3,** 119 (1877) ; K. Schum. in Engl. et Prantl, Nat. Pflanzenf. **4,** pt. 4, 81 (1891) ; [Dale], Trees and Shrubs of Kenya Colony, 143 (1936); Greenway, A Swahili-Botanical-English Dictionary of Plant Names, 30, 209, 301 (1940) ; Hora et Greenway, Check-Lists of the Forest Trees and Shrubs of the British Empire, No. 5, Tanganyika Territory, Part 1, 186 (dated 1940, published 1941).

KENYA COLONY. Rabai, *Rev. W. E. Taylor* 186 (Herb. Mus. Brit.). Mida, Oct. 1930, *G.H. Donald* 452, 94* (Herb. Imp. For. Inst., Oxon.) :—shrub to 1.5 m. ; used for making arrows : vernacular name " Kifiofio ". Thicket, Kilifi, " sl.", 8 Jan. 1937, *J. Y. Moggridge* 333 (Herb. Kew.). Coast, *R. E. St. B. Baker* 1104 (Herb. Kew.) :—vernacular names (Swa.) " Ukuba Mwitu ", (Sanya) " Mkuba adasti ".

TANGANYIKA TERRITORY. Coast opposite Zanzibar, Mar. 1870, *Kirk* s.n. (Herb. Kew.). Kibuguni district, 45 m., 25 Nov. 1936, *P. J. Greenway* 4769 (Herb. Imp. For. Inst., Oxon.) :—much branched, evergreen shrub up to 5 m. tall ; fruits edible ; local with *Strychnos*, *Gymnosporia* and *Lamprothamnus zanzibaricus* and *Ochna* thickets in *Brachystegia-Pteleopsis myrtifolia* open woodland on red and brown sandy loams : vernacular name (Swa.) " Mvuma nyuki ". Tanga District : Kwamkembe, 1525 m., 13 Jan. 1937, *P. J. Greenway* 4827 (Herb. Imp. For. Inst., Oxon.) :—a virgately branched shrub with small green fruits, common in *Manilkara sulcata*, *Dalbergia elata*, *Grewia*, *Annonaceae*, *Scutia myrtina* evergreen bush on a bright red sandy loam.

ZANZIBAR Is. *Kirk* s.n. (type, Herb. Kew.). " An sterilen Orten ", Sept. 1873, *Hildebrandt* 1177 (Herb. Mus. Brit.). Sweet-scented shrub in sandy soil near sea, *Mrs. Taylor* 62/2 (Herb. Kew.). Mwakajuni-Kurekwe, 3 Dec. 1930, *Greenway* 2642 (Herb. Kew.) :—a pretty shrub up to 2 m. tall with clusters of white flowers ; growing in bush formation on coral rock, not common. *Vaughan* 111 (Herb. Mus. Brit.) :—tall shrub with white flowers, growing in shade. Coll. in 1931, *J. H. Vaughan* 1110, 1112, 1437, 1553, 1595 (all in Herb. Kew.).

This is a variable species. The plants I have associated with the type have the twigs glabrous or sparsely puberulous when young, but nearly always glabrous by the time that the coating of bark develops ; in *Hildebrandt* 1177 a slight pubescence persists on the bark-coated twigs, but the specimen is otherwise typical. The mature leaves are also glabrous and narrowed to an obtuse apex. A sparse puberulence is normally present on the upper side of the petioles—in mature as well as young leaves. Even in the type-group there is considerable variation. The inflorescence may be sessile and the flowers thus in axillary clusters, or there may be a short but distinct peduncle ; both these variations may occur on one and the same plant, as is shown by *Baker* 1104. Variation may also be seen in the length of the pedicels and in flower-size—especially in the length of the corolla tube ; but the extremes are connected by so many intermediates that much importance cannot be attached to these characters. The number of ovules per loculus is inconstant, 2–5 having been counted on different individual placentas. In one flower a trilocular ovary and a trifurcate style was observed. With all these variations the species is, however, usually not difficult to recognise.

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* Both these numbers refer to a single gathering ; they appear in different positions on the same label.

var. **acutifolia** *Brenan* var. nov. ; ramulis juventute dense pubescentibus, indumento quam in typo diutius persistente, vetustioribus verruculosis, foliis apice acutis vel subacutis etiam maturitate ad costam praesertim supra pubescentibus, pedicellis inferne ± pubescentibus, ovario subglabro.

TANGANYIKA TERRITORY. Kilosa, Dec. 1920, *Swynnerton* 1026 (Herb. Mus. Brit.). E. Usambaras : Bombo-Daluni, c. 460 m., 24 Oct. 1935, *P. J. Greenway* 4103 (type of var., Herb. Kew., Herb. Imp. For. Inst., Oxon.) :—a much branched white-flowered evergreen shrub up to 3 m. tall ; local in *Euphorbia*, *Combretum*, *Commiphora*, *Grewia* thicket on red soils. W. Usambaras : Makuyuni Distr., 400–1000m., June 1935, *Koritschoner* 1133 (Herb. Kew.) :—root used for snake-bite treatment : vernacular name (Kisum.) " Mpandua nguku ".

var. **glabrata** (*Oliv.*) *Brenan*, comb. nov.—*Empogona kirkii* Hook.f. var. ? *glabrata* Oliv. in Johnston, The Kilima-njaro Expedition, 341 (1886), *nomen nudum*, et in Trans. Linn. Soc. Bot. ser. 2, **2,** 336 (1887), *cum descr.* ; ramulis persistenter pubescentibus demum glabratis, foliis apice plerumque obtusis vel rotundatis vel nonnunquam etiam leviter emarginatis juventute ad costam pubescentibus vel subtus ubique scabrido-pubescentibus, pedicellis et ovario subglabris vel pubescentibus.

KENYA COLONY or TANGANYIKA TERRITORY ? " 40–60 miles from coast," *H. H. Johnston* (*Kilimanjaro Expedition*) s.n. (type of var., Herb. Kew.).

KENYA COLONY. Rabai, 10 Nov., *Rev. W. E. Taylor* 185 (Herb. Mus. Brit.). Mackinnon Road, 1929, *R. M. Graham* 1651 (Herb. Kew. and Herb. Imp. For. Inst., Oxon.) : (on the typed label of this specimen the number S.211 in brackets is also given) :—small shrub to 0·9 m. ; twigs brittle ; buds pinkish ; flowers white ; fairly strong scent. Ukambane, *G. F. Scott Elliot* (*Ruwenzori Expedition* 1893–1894) 2304 (Herb. Kew.).

Scott Elliot (*Ruwenzori Expedition* 1893–1894) 6150 from Sangwa (" common shrub on laterite") is probably this variety. I have not succeeded in finding the precise geographical position of this locality.

Var. *glabrata* may be distinguished from var. *acutifolia* by the different leaf apex and by the more persistent indumentum of the twigs. *Graham* 1651 provides an instructive example of the amount of variation that may occur in a single gathering. The leaves vary from less than 3 to nearly 6 cm. long and all the variations of apex mentioned in the description may be seen on the same shoot ; the leaves when young may be pubescent all over beneath or the pubescence may be confined to the midrib ; the length of the corolla tube varies between about 4 and 8 mm. I have no doubt, however, that this number all represents the same plant.

var. **taylorii** (*S. Moore*) *Brenan*, stat. nov.—*Empogona taylorii* S. Moore in Journ. Bot. **63,** 145 (1925). *Tricalysia grahamii* Bullock ex [Dale], Trees and Shrubs of Kenya Colony, 143 (1936), *anglice tantum descripta* ; ramulis dense et persistenter pubescentibus demum glabratis, foliis apice obtusis etiam maturitate utrinque sed praesertim subtus dense et breviter pubescentibus subtus mollibus supra scabridis, pedicellis et ovario dense pubescentibus.

Kenya Colony. Giryama*, Oct. 1887, *Rev. W. E. Taylor* s.n. (type of var., Herb. Mus. Brit.) :--used as a cattle medicine in infusion and to increase the supply of milk. Malindi District : Arabuko, Oct. 1929, *R. M. Graham* 2172, B. 698† (Herb. Kew.) :—shrub to 1·2 m., growing in bush ; flowers white or pale pink.

A very distinct variety, to which var. *glabrata* sometimes approaches slightly, but the indumentum on the leaves is never so dense, uniform and persistent as in this plant.

3. **Tricalysia sonderiana** *Hiern* in Oliv. Fl. Trop. Afr. **3,** 119 (1877) ; Bews, Introd. Fl. Natal and Zululand, 198 (1921) ; F. T. Hubbard in Bailey, Stand. Cycl. Hortic. **3,** 3373 (1925)‡ ; Bullock in Kew Bull. 257 (1931) ; Henkel, Woody Plants of Natal and Zululand, 144 (1934).—*Kraussia coriacea* Sond. in Linnaea **23,** 54 (1850) et in Harv. et Sond. Fl. Cap. **3,** 23 (1864–65), non *Tricalysia coriacea* Hiern in Oliv. Fl. Trop. Afr. **3,** 120 (1877).

Portuguese East Africa. Luabo River, 29 May 1858, *Kirk* s.n. (Herb. Kew.). Same locality, 8 Feb. 1861, *Kirk* s.n. (Herb. Kew.). Delagoa Bay, Nov. 1886, *Monteiro* s.n. (Herb. Kew.). Same locality, *Forbes* s.n. (Herb. Kew.). Lourenço Marques, Nov. 1913, *F. A. Rogers* 11809 (Herb. Kew.).

Natal. *Gueinzius* 100 (type, not seen), s.n. (Herb. Kew., Herb. Mus. Brit.). *Gerrard and McKen* 712 (ex Fl. Cap., not seen), s.n. (Herb. Kew.). Coll. in 1852, *Cooper* 1241 (Herb. Kew.). Zululand, *W. T. Gerrard* 1 & 4 (Herb. Mus. Brit.). *W. T. Gerrard* s.n. (Herb. Kew.). Port Natal, *F. B. Grant* s.n. (Herb. Kew.). " Inter frutices pr. Durban ", 30 m., Sept. 1883, *J. M. Wood* 73 (Herb. Mus. Brit.). Inanda, *J. M. Wood* 1091 (Herb. Kew., Herb. Mus. Brit.). Shafton, Howick, spring 1900, *Mrs. Hutton* 68 (Herb. Mus. Brit.). " Dünengebüsche ", Winkle Spruit, Durban, 20 m., 7 Nov. 1911, *H. Rudatis* 1480 (Herb. Kew.) :—flowers white. Doonside, Oct. 1933, *J. Wylie* s.n. (Herb. Kew.) :—flowers white, tinged pink.

British Guiana (cultivated). Botanic Gardens, Georgetown, Dec. 1905, *without collector's name, no.* 8731 (Herb. Kew.). Same locality,

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* Giryama is in Kenya, not in Tanganyika Territory as S. Moore (*l.c.*) erroneously stated.

† Both these numbers occur on the same label.

‡ I have not been able to refer to earlier editions of this work.

Dec. 1908, *without collector's name, no.* 8751 (Herb. Kew.). Both previously determined as *T. ovalifolia* Hiern.

The writer has not seen the actual type specimen of this species ; the un-numbered specimens in Herb. Kew. and Herb. Mus. Brit. collected by Gueinzius are, however, very probably isotypes. There is no reason to doubt that the plant represented by the specimens cited above is the true *Kraussia coriacea* Sond., with the descriptions of which there is satisfactory agreement. Though it is unquestionably very close to *T. ovalifolia*, there is seldom any difficulty in recognising *T. sonderiana*, whose variation is comparatively slight. The anthers (including appendages) vary in length from 4 to 5 mm. ; those of *T. ovalifolia* are frequently about 6 mm. long, but may sometimes be as short as 4 mm. The geographical ranges of the two species do not appear to overlap.

4. **Tricalysia junodii** (*Schinz*) *Brenan*, comb. nov.—*Empogona junodii* Schinz in Mém. Herb. Boiss. no. 10, 67 (1900).

PORTUGUESE EAST AFRICA. " Delagoa-Bay : forêt de Makorororo, chemin de Khocène ", *Junod* 311 (type, not seen). Lourenço Marques, *J. Borle* 34 (Herb. Kew. ex Nat. Herb. Pretoria).

The position of this among the evergreen species in the key is not certain, as my knowledge of this plant is based only on Schinz's description and Borle's specimen at Kew. The latter is a small fragment and the sheet bears a note that it has been compared with the type. The specimen is in flower and has young leaves towards the ends of the branches ; accompanying the shoot are several evidently mature coriaceous leaves, which are unfortunately all detached, but which apparently belong to the specimen. Schinz also describes the leaves as coriaceous. Now the writer has seen only young leaves on flowering specimens of deciduous species, and the consistency of the mature leaves on fruiting specimens differs from that of the young leaves. The presence of both very young and mature leaves with the Borle specimen suggests that it is indeed evergreen, but certainty over this matter must wait until further material has been seen. As far as can be judged from the exiguous material available, this species is more closely related to *T. allenii* than to the two preceding species and, if truly evergreen, may be regarded as in some degree linking up *T. allenii* and *T. ovalifolia*.

5. **Tricalysia allenii** (*Stapf*) *Brenan*, comb. nov.—*Empogona allenii* Stapf in Kew Bull. 79 (1906).

" RHODESIA. Near the Victoria Falls ", Oct.–Nov., *C. E. F. Allen* 55 (type, Herb. Kew.) :—a small shrub, extremely pretty ; the fluffy flowers have the scent of parma violets. No locality is given on the sheet of *Allen* 55 ; I therefore copy that given by Dr. Stapf with the original diagnosis. No note is made of whether it was in Northern or Southern Rhodesia, the R. Zambesi forming, at the Victoria Falls, the boundary between the two territories.

It is unfortunate that, when *Empogona kirkii* and *E. allenii* are united under *Tricalysia*, the former epithet cannot be adopted for the combined species owing to its preoccupation in *Tricalysia*.

The greater range of material of *E. kirkii* now available shows that the supposedly distinguishing characters assigned by Dr. Stapf to *E. allenii* are not nearly so well marked as was then assumed. In the writer's opinion the last-named species can only be looked upon as a large-flowered variant of *E. kirkii*, if, indeed, further material will not make it desirable for both to be treated as strictly synonymous. Dr. Stapf distinguished his species from *E. kirkii* by the larger, pendulous flowers on much longer pedicels. Now, in material of the latter species, pendulous flowers are shown clearly in *Martin* 428/32, where the corolla is only 7–9 mm. long ; in *Martin* 74/31 the corolla varies in length from 8 to 10 mm., and in other specimens a continuous variation from this size to the small flowers of typical *E. kirkii* is to be observed. There is in the Kew Herbarium an interesting specimen collected on 9 Dec. 1929 near West Nicholson in Southern Rhodesia (*I. B. Pole Evans* 2571) ; it has been at different times determined both as *Empogona allenii* and as *E. kirkii* ; the flowers appear to vary on one and the same shoot from pendulous to horizontal or sub-erect ; the corolla varies in length from 9 to 11·5 mm. and the pedicels from 2 to 6 mm., in fact it effectively bridges the alleged gap between the two " species ". For the present, at least, it appears desirable to maintain typical *E. allenii* as distinct, characterised by its very large corollas about 12 mm. long and its longer pedicels 6–8 mm. long, and to maintain *E. kirkii* as a separate variety.

var. **kirkii** (*Hook.f.*) *Brenan*, stat. nov.—*Empogona kirkii* Hook.f. in Hook. Ic. Pl. t. 1091 (1871) ; Hiern in Oliv. Fl. Trop. Afr. **3,** 115 (1877), non *Tricalysia kirkii* Hiern, *l.c.* 124 (1877). *Hypobathrum kirkii* (Hook.f.) Baill. in Adansonia **12,** 205 (1878).

NYASALAND. Cape Maclear on Lake Nyasa, Oct. 1861, *Kirk* s.n. (type of *Empogona kirkii*, Herb. Kew.).

NORTHERN RHODESIA. Boruma, Jan. 1891, *Menyharth* 1144 (Herb. Kew.). Shrub in dense Mutemwa [no precise locality indicated, but probably from near the Kafue River], *J. D. Martin* 74/31 (Herb. Imp. For. Inst., Oxon.). Riverbank and forest [without precise locality, but probably from near the Kafue River], 1931, *J. D. Martin* 127/31 (Herb. Imp. For. Inst., Oxon.) :—bush 2·4 m. high : vernacular name (Tok.) " Muntokosia ". Shrub in forest [without precise locality], 1931, *J. D. Martin* 143/31 (Herb. Imp. For. Inst., Oxon.) :—vernacular name same as for no. 127/31. In *Isoberlinia globiflora* forest at Ngwesi, 8 Dec. 1932, *J. D. Martin* 428/32 (Herb. Imp. For. Inst., Oxon.) :—shrub to 3 m. high and 1·2 cm. diameter at breast height.

BECHUANALAND PROTECTORATE. Chobe District : near Kasinka, in *Combretum* thicket marginal to *Baikiaea* forest, Apr. 1938, *O. B. Miller* B/191 (Herb. Imp. For. Inst., Oxon.).

The excellent series of specimens collected by the late Mr. J. D. Martin show the plant in all stages from bud to fruit, though it must be realised that in the absence of flowers there must be some doubt whether specimens are to be placed under typical *T. allenii* or var. *kirkii*. Of the specimens cited *Martin* 127/31, *Martin* 143/31 and *Miller* B/191 lack flowers. The description of the leaves by Sir J. D. Hooker was made from Kirk's specimen, which is in flower, with the leaves not nearly fully developed. In *Martin* 143/31, which is in fruit; the leaves are chartaceous, ovate-oblong to elliptic-oblong, and those that are apparently mature range in size from 5·5 to 10·3 cm. long and 3·1 to 5·7 cm. wide. In the typical plant the pedicels and calyx-tube are densely grey-pubescent ; the young leaves are covered by a similar indumentum, but, as the leaves expand, the indumentum becomes more spaced out (although still persistent and dense) and the lower surface of the dried leaves is a pale dull olive-green colour. During the flowering period the pedicels vary in length from about 2 to 5 mm., in fruit they elongate to as much as 12 mm. The length of the corolla-tube varies from about 4 to 6 mm., that of the lobes from about 3 to 5 mm. The specimen collected by Menyharth shows very small flowers, while those collected by Martin have larger flowers, but not only do many intermediates occur but considerable variation in size may be observed in one and the same specimen. The writer has no doubt that these comparatively slight differences should be regarded as falling within the range of intravarietal variation and that they are of insufficient importance and constancy to justify the creation of further taxonomic groups. The larger flowers may be looked upon as forming approaches to typical *T. allenii.*

The fruits of this species do not appear to have yet been described. The following description is based on *Martin* 143/31 and *O. B. Miller* B/191 ; it is important to note, however, that the fruits are possibly not fully ripe :—Fructus pedicello 8–12 mm. longo suffultus, ut videtur bacciformis, subglobosus, circiter 4–6·5 mm. diametro, in statu sicco niger, pilis brevibus patentibus densiuscule conspersis pubescens, lobis calycis persistentibus coronatus, bilocularis ; pericarpium crassiusculum; semina in utroque loculo 2, castanea, subellipsoidea, concavo-convexa, circiter 3–4 mm. longa, 2–3·25 mm. lata, cellulis testae prominentibus obtuse verruculosa.

var. **australis** (*Schweickerdt*) *Brenan*, comb. nov.—*Empogona kirkii* Hook.f. var. *australis* Schweickerdt in Bothalia **3**, 255 (1937); Hutchinson, A Botanist in Southern Africa, 671 (1946).

TRANSVAAL. Zoutpansberg, Nov. 1932, *Obermeyer*, *Schweickerdt* and *Verdoorn* 72 (type of var., Herb. Kew.) :—small shrub ; flowers white with densely bearded mouth. Lower slopes of Zoutpansberg at Zoutpan, 12 Apr. 1934, *Schweickerdt* and *Verdoorn* 528 (Herb. Kew.).

Very distinct from typical *T. allenii* and var. *kirkii* in the leaves which are glabrous or subglabrous beneath, even in a fairly young state. The pedicels and calyces are also much less hairy than in the type. Schweickerdt describes the leaves of var. *australis* as " multo majoribus " ; although the leaves of the flowering specimens are somewhat larger than in comparable specimens of normal *T. allenii* var. *kirkii* (e.g. the type-specimen), the fully developed leaves on some of Martin's specimens from Northern Rhodesia are considerably larger than any to be seen in those of var. *australis.*

Another specimen, collected at Waterpoort, Zoutpansberg District, 640 m., Sept. 1918 by *F. A. Rogers* (no. 21858, Herb. Kew.), is probably referable to var. *australis*, but has even more glabrescent pedicels and calyces. It is possible that *T. allenii* var. *kirkii* also occurs in the Transvaal ; *Lang* 32285 (Herb. Kew.), from Punda Maria, Zoutpansberg District (16 Nov. 1932), has the pubescence on pedicels and calyx of typical *T. allenii* and of var. *kirkii*, and the leaves are also rather densely pubescent, although admittedly extremely young ; the pedicels, however, are very short and the buds are curiously short and broad. The variation within the comparatively small amount of material that has been collected in the Transvaal is surprising, and it is to be hoped that botanists in the northern part of that territory will make careful observations on these plants in the field and will collect material exhibiting the various stages of development.

DOUBTFUL SPECIES.

Hypobathrum lagoense *Baill.* in Adansonia **12,** 210 (1878).

PORTUGUESE EAST AFRICA. Delagoa Bay, *Forbes* 12 (not seen).

According to Baillon, this is very close to and perhaps a form of *T. ovalifolia.* The style of this plant is said sometimes to lack one of its two apical divisions, so as to be asymmetrically clavate at apex. The writer has not seen this in any of the species dealt with, but the style divisions of *T. allenii* var. *kirkii* may frequently be markedly unequal, and a similar but less pronounced inequality occurs rarely in *T. ovalifolia* and *T. sonderiana.*

The type of *Hypobathrum lagoënse* is said (*l.c.*) to have been issued from the herbarium of " la Société d'horticulture de Londres ". In response to a request made by the writer, the Director of the Royal Horticultural Society's Gardens at Wisley, to whom I am indebted for his courtesy and care in this matter, kindly had the society's Herbarium searched for material of this plant, but without success.

ALBERT BRUCE JACKSON.—We much regret to record the death at his home, 3 The Avenue, Kew Gardens, on 14 January 1947, of Mr. A. B. Jackson. Bruce Jackson was well known at Kew in connection with his work on cultivated trees. He was born on 14 February 1876 at Newbury, where he was brought up by his mother. After leaving school he was occupied in journalism till February 1907 when he was appointed to a temporary post in the Herbarium at Kew. Shortly afterwards he became assistant to H. J. Elwes and A. Henry in their work on " The Trees of Great Britain and Ireland," a work whose preparation was centred at Kew. From 1910 to 1932 he was employed as a technical assistant at the Imperial Institute, and from 1932 to the time of his death he worked as a part-time specialist in the Department of Botany, British Museum (Natural History). The knowledge and experience he accumulated while working with Elwes and Henry was turned to good *purpose through his recordings of* collections of woody plants at Syon House, Yattenden Court, Albury Park, Westonbirt, and Borde Hill. In 1923, in collaboration with W. Dallimore of Kew, he published "A Handbook of *Coniferae*," which was in process of revision for a third edition at the time of his death. He collaborated with H. Clinton Baker in the writing of "Illustrations of new Conifers," and in 1946 issued "The identification of Conifers" which is essentially keys and illustrations from the larger "Handbook."

Bruce Jackson was of a quiet and kindly temperament, always ready to assist anyone who applied to him for help. He had an excellent knowledge of British flowering plants and mosses and had useful private herbaria of both groups. He will be greatly missed by his many friends on the Kew staff.

W. B. TURRILL.

TWO NEW CHASMOPHYTES FROM THE ANTILEBANON.

PETER HADLAND DAVIS

The new species described in this paper were collected during a traverse of the Antilebanon, on foot, from Neb'k to Baalbek in June, 1943, and again, by a somewhat different route, in August, 1945. An account of the earlier journey appeared in the Journal of the Royal Horticultural Society, January, 1944.*

Ajuga chasmophila *P. H. Davis* sp. nov. (Sect. *Chamaepithys* Benth.).

Affinis *A. chiae* Schreb. praesertim *A. chiae* Schreb. var. *latilobae* Boiss., sed habitu robustiore hemispherico villosissimo, laciniis calycis tubo 3–5-plo longioribus distinguitur. Species facie distincta, eximie rupicola.

Perennis, pluricaulis, basi lignosa, saxatilis, habitu hemispherico, aromatica, caulibus foliisque pilis longis patulis et breviter glandulosis molliter villosissimis. *Caules* floriferi simplices, fragiles, ± flexuosi, 5–10 cm. longi, 1 mm. lati, trientibus duobus superioribus vel saltem dimidio superiore racemos densos oblongo-ovatos simplices efformantes, verticillastris bifloris. *Folia* radicalia obovata, in petiolum laminam aequantem attenuata, integra vel 1–3-crenata, evanescentia, caulina spathulato-cuneata aliquantum breviter trilobata vel indivisa, emarcida

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* DAVIS, P. H. "Through the Antilebanon." *Journ. Roy. Hort. Soc.* **69**. 7–13 (1944).

persistentia congesta, floralia late cuneato-attenuata trinervia ad marginem revoluta, 1.5–3 cm. longa, 1–2 cm. lata, ad ⅓–½ tripartita lobis obtusis ovato-oblongis 2–5 mm. latis. *Flores* brevipedicellati folia floralia superantes. *Calyx* tenuis, 6–10 mm. longus, patule villosus, laciniis inaequalibus lineari-lanceolatis quam tubo triplo- aut quintuplo- longioribus. *Corolla* magna, sparse hisuta, 2.3–3 cm. longa, calycem circa quadruplo superans, aurea, inferne rubro-striata, tubo manifeste exserto, labio superiore (haud tubo) ad basin fisso, lobo labii inferioris medio superne orbiculari emarginato tubum aequante vel paulo longiore. *Nuculae* transverse corrugatae, 2–3 mm. longae. Floret Mai.-Aug.

SYRIA. Antilebanon : Falîta above Neb'k, circ. 1800 m., in crevices of vertical cliffs ; perennial herb, hemispherical ; corolla bright yellow with reddish spots, 21.6.1943, *P. H. Davis* 6591 (typus in Herb. Kew.) ; ibid., 10.8.1945, *P. H. Davis* 9911.

Boissier, though fully aware of the polymorphic character of *Ajuga chia* Schreb., considered *A. vestita* Boiss., *A. bombycina* Boiss. and *A. laevigata* Boiss. to merit specific rank, and Dr. W. B. Turrill in his revision of this group* has followed Boissier's classification. The new species described above is so distinct in general habit from any of the varieties of *A. chia* Schreb. or its closely related species that there seems good reason for giving it specific status. I have related the new Irano-Turanian species to *A. chia* Schreb. var. *latiloba* Boiss., to which, on account of its wide bracts and large flowers, it has the closest taxonomic affinity. Besides its distinct facies, however, *A. chasmophila* has much longer calyx lobes than are usually found in the polymorphic *A. chia* Schreb. The form of the basal leaves (described from a cultivated plant) may also be a distinctive character.

Ecologically *A. chasmophila* is perhaps unique in Sect. *Chamaepithys*, being confined to crevices of vertical cliffs, where it is accompanied by *Hypericum nanum*. Though I have in the Near East frequently found forms of *A. chia* Schreb. in rocky places, I have never observed them on vertical rock—a habitat characterised by distinct and conservative plant communities. It should be noted that *A. chia* Schreb. var. *suffrutescens* Boiss. was collected on the slopes below the cliffs on which the new species was found.

In cultivation *A. chasmophila* retains the taxonomic characters cited in the diagnosis, but is difficult to grow.

Euphorbia promecocarpa *P. H. Davis* sp. nov. (Sect. *Tithymalus* Boiss. §*Esulae* Boiss.).

Ab *E. caudiculosa* Boiss. et *E. bounophila* Boiss. species haec habitu pulvinari, pubescentia, caulibus brevioribus fere ad basin dense foliosis, foliis tenuibus (haud crassiusculis), inflorescentia dichotoma, capsula minore rectangulari-oblonga, forma seminum inter alia differt.

Planta pulvinaris, petrophila, pallide virens, dense vel sparse pubescens, caulibus e rhizomate crasso lignoso numerosissimis tenuibus flexuosis, 3–7 cm. longis, fere ad basin crebre foliosis. *Folia* exstipulata, alterna, subsessilia, integra, 1–4 mm. longa, 0.8–3 mm. lata, infima minima

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* TURRILL, W. B. "The correlation of morphological variation with distribution in some species of Ajuga." *New Phytol.* 33, 218–230 (1933).

suborbicularia, superiora obovata ; floralia opposita orbiculari-rhomboidea, mucronulata, 3–6 mm. longa, 2–5 mm. lata. *Inflorescentia* breviter dichotoma, saepe ad cymam 1–3-floram reducta. *Involucrum* turbinatum, circ. 1.5 mm. longum, lobis linguiformibus emarginatis hirtis, glandulis transverse ovato-ellipticis fuscis, cornibus tenuibus latitudinem glandularum aequantibus, bracteolis inter flores masculos plumosis. *Styli* divisi. *Capsula* rectangulari-oblonga, 2–2.5 mm. longa, 1.5 mm. lata, pubescens, trisulcata, laevis, coccis dorso haud alatis. *Semen* pallide griseum, breviter cylindricum, 1.5–2 mm. longum, fere laeve aut superficialissime sparse malleatum, dorso vix carinato, carunculo manifeste subgloboso ⅓–⅕ semen aequante. Floret Mai.-Aug.

SYRIA. Antilebanon : Falîta above Neb'k, circ. 1800 mm., vertical rocks, 21.6.1943, *P. H. Davis* 6573 (typus in Herb. Kew.) ; Ibid., 10.8.1945, *P. H. Davis* 9907 ; Yebrûd, circ. 1500 m., dry rocks, 10.8.1945, *P. H. Davis* 9897.

The specimens from Yebrûd are less pubescent and have somewhat shorter fruits than those from Falîta.

E. promecocarpa is taxonomically very distinct. Apart from its cushion habit and pubescent indumentum, the unusual shape of its rectangular-oblong capsule at once distinguishes it from *E. caudiculosa* Boiss. and *E. bounophila* Boiss. (from the Lebanon and S. Persia respectively), to which it appears to be most closely related. The seeds are so lightly sculptured as to be almost smooth, in this respect resembling *E. caudiculosa* Boiss. rather than *E. bounophila* Boiss., though the seeds differ from both in their shape and size. To *E. herniariifolia* Willd. the new species seems more distantly related, owing to the winged carpels of the latter's fruit and the deep pitting of its seeds.

E. promecocarpa prefers the driest rocks, being generally accompanied there by *Reutera tenuis*. In arid overhangs it is often the only species found.

I should like to thank Professor Sir William Wright-Smith and Dr. H. R. Fletcher for their advice in the preparation of the diagnoses.

NEW OR NOTEWORTHY PLANTS FROM WEST TROPICAL AFRICA.

A. C. Hoyle and J. P. M. Brenan.
(Imperial Forestry Institute, Oxford.)

CELASTRACEAE.

Campylostemon kennedyi (*Hoyle*) *Hoyle et Brenan*, comb. nov.

Hippocratea kennedyi Hoyle in Kew Bull. 1932, 263.

This species has 5 stamens and conforms in other respects also to the characters of *Campylostemon* Welw. *ex* Benth. & Hook. f. Gen. Pl. **1,** 998 (1862) and as further elucidated by Loesener in Notizbl. Bot. Gart. Berl. **13,** 563–577 (1937), where a key and descriptions of 10 species are given. *C. kennedyi* has leaves intermediate between the size-classes on which Loesener's key is primarily based, suggesting that the size and shape of the leaves is not altogether satisfactory as a primary character for dividing the genus.

The transfer of *Hippocratea kennedyi* to *Campylostemon* makes desirable the publication of a new comparative diagnosis, thus :—a *C. lindequistiano* Loes. et *C. duchesnei* De Wild. et Th. Durand (e descript.) petalis obovato-cuneatis, a *C. laurentii* De Wild. inflorescentiis multo gracilioribus et brevioribus, foliis plerumque angustioribus ellipticis usque obovato-lanceolatis apice magis et acutius acuminatis differt.

A. C. H. & J. P. M. B.

Campylostemon warneckeanum *Loes. ex Fritsch* in Bot. Centralbl. Beih. **11,** 344 (1901).

In correcting a determination of a specimen in the Imperial Forestry Institute Herbarium (*C. Vigne* 2920 from the Gold Coast), which had been named *Hippocratea oliveriana* Hutch. & M. B. Moss, we found that it agreed with the description of *Campylostemon warneckeanum* Loes. ex Fritsch. The specimens quoted by Loesener under the latter species in his revision of *Campylostemon* in Notizbl. Bot. Gart. Berl. **13,** 572 (1937), are *Warnecke* 157 & 302. Fortunately a duplicate of *Warnecke* 302 is deposited in the British Museum Herbarium, and *Vigne* 2920 matches it in all respects.*

This gathering extends the known range of *Campylostemon warneckeanum* Loes., hitherto recorded only from Lome and Bagida in Togoland. The citation of the additional material and notes follows :—

GOLD COAST. Ashanti : Jimira Forest Reserve, 275 m., fl. May 1933, *C. Vigne* 2920 (Herb. Imp. For. Inst., Oxon.) :— liane in forest ; small white flowers, turning yellow before falling.

During the investigation described above, we noticed that *Warnecke* 302 was referred in Hutchinson and Dalziel, Fl. W. Trop. Afr. **1,** 450, to

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* Duplicates both of the type specimen (Warnecke 157) and of Warnecke 302 are in the Kew Herbarium.—Ed.

Hippocratea oliveriana Hutch. & M. B. Moss. Both the description of *Campylostemon warneckeanum* Loes. and the sheet of *Warnecke* 302 examined in the British Museum Herbarium show that this gathering is not congeneric with *Hippocratea oliveriana.*

The genus *Campylostemon* (placed by Loesener in *Celastraceae* because of its isomerous flowers) was not included in the Flora of West Tropical Africa, so that the above records are additional to that work.

A. C. H. & J. P. M. B.

ANACARDIACEAE.

Pseudospondias microcarpa (*A. Rich.*) *Engl.* var. **hirsuta** *Brenan*, var. nov. ; folii rhachide petiolulis costa nervisque lateralibus foliolorum praesertim subtus plus minusve hirsuto-pubescentibus differt.

NIGERIA. Oyo Prov., Ibadan Distr. : near Oke Eleyele and the Base Hospital, Ibadan, 7 Nov. 1945, *A. P. D. Jones and R. W. J. Keay, Forest Herbarium, Ibadan No.* 13895 (typus varietatis in Herb. Kew. et Herb. Imp. For. Inst., Oxon.) :—tree about 12 m., with wide and low-spreading crown ; bole about 1 m. ; bark grey, slash with green edge, pale cream-straw ; sapwood white ; older branchlets, undersides of leaves and veins with some indumentum ; young leaves brownish-red ; flowers cream-green.

The specimen, which shows branchlets, leaves and ♂ inflorescences, appears to differ from normal *P. microcarpa* only in the remarkable development of indumentum on the vegetative parts. Some hairs are to be seen on the lower surface of the leaflets away from the nerves and also on the margins towards the base.

J. P. M. B.

Pseudospondias longifolia *Engl.* in Engl. Bot. Jahrb. **36,** 218 (1905).

NIGERIA. Ogba Reserve, without date, *J. D. Kennedy* 2454 (Herb. Imp. For. Inst., Oxon.).

Distr. Cameroons (*Zenker* 1236, Bipinde). Now recorded for the first time from Nigeria and the area of the Fl. W. Trop. Africa. From *P. microcarpa* (A. Rich.) Engl., the only species of the genus given by Hutchinson and Dalziel, *P. longifolia* is readily distinguished by its trimerous flowers with broader petals.

J. P. M. B.

CAESALPINIACEAE.

Brachystegia nigerica *Hoyle et A. P. D. Jones*, sp. nov. (Caesalpiniaceae —Amherstieae); a cognata *B. eurycoma* Harms inflorescentiis et floribus minoribus, petiolo breviore, foliolis pluribus cum fructu multo minoribus, rachidis alis anguste recurvatis neque erectis*, satis distincta.

Arbor alta ; ramuli hornotini tenues, 1–2 mm. diametro, vivi brunnei, teretes, nitiduli, in sicco sulcato-striati, atropurpurei, glabri, interdum

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* This valuable diagnostic character is not immediately apparent, but close examination will readily reveal it.

glauci; annotini teretes, purpureo- vel cinereo-brunnei, lenticellis parvis (0.4×0.2 mm.) longitudinaliter ellipticis albido-brunneis prominentibus. Foliorum *alabastra* (minora) 1·5 mm. longa, late ovata, obtusa, compressa, squamis (duabus solis manifestis) valde carinatis pubescentibus ; majora ovoidea, vix compressa, squamis 4–6, castaneo-brunneis striatis ferrugineo-ciliatis (duabus infimis solis pubescentibus carinatisque). *Stipulae* fugaceae (in ramulo uno perjuvenili tantum visae) connatae, intrapetiolares, verisimiliter integerrimae, foliaceae, sine auriculo basali, 10–20 mm. longae, usque ad 9 mm. latae, oblanceolatae, carinatae, minute ciliatae praeterea glabrae, costa et nervis nonnullis lateralibus subtus prominentibus. *Folia* 8–16 cm. longa, 4–7 cm. lata, foliolorum jugis 5–9, plerumque 6–8, fere vel satis contiguis, gradatim apicem versus majoribus ; petiolus 4–7 mm. longus, supra canaliculatus, glaber vel puberulus, dimidio vel ultra pulvinatus, in sicco nigrescens, rugosus ; rachis 4·5–11 cm. longus, 1–1·3 mm. diametro, pilis brevibus crispatis puberulus, supra canaliculatus et inter jugos foliolorum anguste alatus, alis recurvatis*, subtus in vivo teres, in sicco sulcatus, pilis paullum longioribus (quam supra) indutus ; internodiis inter jugos infimos 0·5–1 cm., inter distales 2 cm. longis ; *foliola* supra (costa excepta) glabra vel fere glabra, subtus glabra, supra in statu florescente nitidula, matura opaca ; *foliola basalia* 0·5–2 cm. longa, 0·3–1·2 cm. lata, late elliptica vel oblonga, basi subcordata, apice emarginata, costa paullum obliqua ; *foliola media* 1·5–4 cm. longa, 0·8–2 cm. lata, elliptica vel obovato-oblonga, interdum paullum falcata, basi oblique subcordato-cuneata vel truncata, apice emarginata, costa valde obliqua et excentrica ; *foliola distalia* 2–7·5 cm. longa, 1·5–3·5 cm. lata, oblique obovata, ad basim truncatam vel subcordatam cuneata vel rotundata, apice emarginata vel subacuminato-emarginata, costa paullum curvata et valde excentrica ; omnium costa supra subprominens et puberula, subtus prominens et glabra vel puberula ; nervi laterales angulo semirecto a costa abeuntes et intra marginem arcuati, cum venis reticulatis in statu florescente utrinque prominentes, maturitate subprominentes ; nervi basales citra costam foliolorum basalium 2 (–3), distalium 3–4 (–5), laterales trans costa 7–10. *Inflorescentia* terminalis, breviter pedunculata, subcorymboso-paniculata, congestiflora, 3–4 cm. diametro, axe ramulisque puberulis ; bracteae caducissimae, orbiculares, subcupulares, 1·5 mm. diametro, plus minusve puberulae, margine ferrugineo-ciliatae ; pedicelli 3–5 mm. longi, 0·5–1 mm. crassi, puberuli ; bracteolae 6–7 mm. longae, 4 mm. latae, obovato-ellipticae, extra et in margine dense puberulae, intus glabrae. *Perianthii squamae* 5 (quorum interdum duo vel tres ad medio connatae) inaequales, 2–2·5 mm. longae, 0·75–1 mm. latae, ellipticae, apice subacutae vel irregulariter dentatae vel breviter trifidae, ad margine ciliatae, basi in tubo brevissimo circiter 0·5 mm. longo connatae. *Stamina* 10, basi ultra perianthium brevissime connata, tubo obliquo 0·2–0·4 mm. longo, filamentis 8–10 mm. longis teretibus vel basim versus paullum compressis, antheris suborbicularibus 1·2 mm. longis. *Ovarium* usque ad 3 mm. longum, valvis in medio glabris praeterea ferrugineo-crispato-villosis glabrescentibus, stipite 3 mm. longo prope apicem sparse villoso, stylo 9–10 mm. longo, in triente inferiore

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* This valuable diagnostic character is not immediately apparent, but close examination will readily reveal it.

sparse villoso. *Legumen* 9–14 (interdum ad 17) cm. longum, 3·5–4 cm. latum, late oblongo-naviculiforme, crasse coriaceum, extra leve, nitidulum, atropurpureum vel atrobrunneum, lenticellis minutis perinconspicuis, intus subfusco-brunneum, angulo recto ad stipitem tenuiusculum 6 mm. longum, 2–2·5 mm. diametro adjunctum ; sutura superiora utrinque alata, alis oblique ascendentibus (vel patentibus ?) 2–3 mm. latis ; rostrum (praefracto solo viso) verisimiliter parvum. *Semina* complanata, orbicularia, 1·5–2 cm. diametro, verisimiliter atropurpurea, nitida.

NIGERIA. Onitsha Province : Awka, in C.M.S. Compound, flowers and one leaf (spirit material only) 2 Jan. 1945, *Rev. K. H. Prior* s.n. (type of flowers, divided between Kew and Herb. Imp. For. Inst., Oxon.) ; same locality, leaves only, 3 June 1942, *A. P. D. Jones, Forest Herb., Ibadan No.* 6609 (Herb. Imp. For. Inst., Oxon. ex Ibadan) ; Onitsha Province, without precise locality or date, *D. F. Chesters* " d " (of A 124/30) (Herb. Kew., Herb. Imp. For. Inst., Oxon.) ; Onitsha (town ?) old and very young leaves, 3 Sept. 1909, *A. H. Unwin* 66 (Herb. Kew.). Ogoja Province : Ikom Division, 2 miles south of Ekọ̀sọ̀rọ̀ in small stream-valley, tributary of Cross River, old leaves only, 27 April 1942, *A. P. D. Jones, Forest Herb., Ibadan No.* 6484 (Forest Herb., Ibadan). Benin Province (?) : Ubiaroko, near Kwale, young inflorescences and leaves, and old fruits, Dec. 1932, *J. R. Ainslie* 15 (Herb. Kew., Herb. Imp. For. Inst., Oxon., Forest Herb., Ibadan). Ondo Province (?) : in broken forest near U.A.C. road-trace north of Oluwa Reserve and about 5 miles north of the Shasha Reserve boundary, old leaves, fruit from ground, 10 Feb. 1946, *A. P. D. Jones* and *C. F. Onochie, Forest Herb., Ibadan No.* 14732 (Herb. Imp. For. Inst., Oxon. ex Ibadan). Without locality or date, old leaves and fruits, *J. D. Kennedy* 1842, type of fruits (divided between Kew and Herb. Imp. For. Inst., Oxon.).

Note. Prior s.n. (the type) and *Jones, F. H. I. No.* 6609, were collected from trees in the same compound, but whether from the same individual is not known.

Field Notes.

Tree 18 m. high, young leaves yellowish-brown ; on red acid sands at edge of relic forest patch (*A. P. D. Jones, F. H. I. No.* 6609). Young tree 15–18 m. high and 68 cm. diameter ; bark smooth, light grey, with a few raised, transverse rings ; inner bark when cut pinkish, with lighter streaks, darkening in a few minutes to a rich brown, fragrant ; sapwood white ; in small stream valley in rather open, degraded high forest, with *Elaeis guineënsis, Ricinodendron africanum* and *Pterocarpus sp.* (*A. P. D. Jones, F. H. I. No.* 6484). Tall tree about 27 m. by 1·8 m. girth (*Jones* & *Onochie, F. H. I. No.* 14732).

Large tree up to about 36 m. by 3·6 m. girth ; bark of old trees rather rough, scaling in large irregular plates ; locally common throughout S. Nigeria (Oyo, Ondo, Benin, Onitsha, Owerri and Ogoja Provinces), often gregarious and forming small patches on the moister sites in high forest ; very common in the wet forests in Shasha Reserve and not confined to stream banks, although common in riverain high forest ; seedlings and suckers have 3–4 pairs of leaflets with the apical pair very large ; young trees up to 15–18 m. have usually 5–6 pairs of leaflets with the apical pair still obviously the largest ; large mature trees have usually 8–9 pairs of leaflets with the apical pair broader and more obovate but only a little longer than the next pair below. (A. P. D. Jones, notes from general observation).

Vernacular name (Ibo): ACHI (*Unwin* 66).

Note. The name ACHI is used for all species of *Brachystegia* throughout the Ibo country (A. P. D. Jones).

A. C. H.

ROSACEAE.

Acioa johnstonei *Hoyle, descr. ampl.*

This species was originally described in Kew Bull. 1932, No. 6, 258, from a flowering specimen, *A. T. Johnstone* J 74/31, collected at Bum, Bamenda District, British Cameroons, in January 1931 and deposited at Kew and Oxford. The fruiting stage of the same species, collected in the same district by *T. D. Maitland* (No. 1401) in June of the same year, has now been made available through the energy and by the courtesy of the late Mr. A. P. D. Jones, Curator of the Forest Herbarium, Ibadan, Nigeria. Part of the Ibadan specimen of *Maitland* 1401 is now deposited in the Imperial Forestry Institute Herbarium, Oxford. There is also a duplicate of the type specimen at Ibadan. The following amplification of the specific description appears desirable :—

Branchlets with age becoming rough with prominent, circular lenticels. *Leaves* up to 11·5 cm. long. *Fruiting inflorescence-axis* up to about 10 cm. long, the spreading pilosity persistent ; fruiting pedicels 2–3 cm. long, stout, increasing in diameter from 1·5 mm. near the base to 2·5 mm. near the thickened apex, shortly pubescent and also sparsely pilose with long spreading hairs, ebracteate or with the glandular-ciliate bracts still persistent ; one or more petals and the indurated staminal sheath sometimes persistent below the fruit; stipe of the fruit very short and stout, 2 mm. long, 4 mm. thick. *Fruit* 2–3·5 cm. long, 2–3 cm. broad, ovoid, very broadly rounded at the base, rounded or obtuse at the apex, covered with a very dense, short, velvety, pale brownish-olive tomentum mixed with longer setose hairs, the surface beneath blackish-purple, somewhat rugose and with scattered, sub-prominent, smooth tubercles or lenticels ; epicarp thin, coriaceous, brittle when dry, separating with difficulty from the reddish-brown, rather fibrous, lamellate mesocarp, the two together 1 mm. thick ; endocarp 1 mm. thick, pale reddish-brown, separating easily from the mesocarp, the inner surface glabrous, marked with fine, anastomosing striae. *Seed* firmly fleshy, ovoid, up to 2·6 cm. long and 1·6 cm. broad when dry, blackish-purple, longitudinally wrinkled, striate like the inner surface of the endocarp by the pressure of the covering of long, stiff, appressed, downwardly directed, brownish-yellow, setose hairs.

BRITISH CAMEROONS. Bamenda District, Forfuka (or Fonfuka ?), 1220 m., fruit June 1931, *T. D. Maitland* 1401 (type of fruit, Herb. Imp. For. Inst., Oxon., Forest Herb., Ibadan, Nigeria). A small tree or shrub on edge of forest.

A. C. H.

RUBIACEAE.

Tricalysia discolor *Brenan*, sp. nov. ; *T. macrophyllae* K. Schum. affinis, ramulis primo juventute glabris nec adpresse puberulis, stipularum vaginis brevioribus intus glabris nec sericeis acuminibus multo brevioribus glaberrimis, venis inter nervos laterales foliorum transversis magis irregularibus et multo inter sese distantioribus, venulis ultimis in areolis retis venarum subtus plus minusve occultis nec elevato-prominentibus, calyce marginibus loborum ciliolatis exceptis glabro, ovarii loculis biovulatis distat ; praeterea ob endospermium ruminatum in genere ut videtur egregia.

Arbor parva vel mediocris, 6–9 m. alta, trunco 60–90 cm. circumferentia. *Ramuli* validi, ut videtur glabri sed pilis minutissimis nonnisi microscopice cernendis sparse vestiti, laeves, griseo-brunnei, novelli siccitate plus minusve bisulcati, serius subteretes vel obtuse subangulati, 2·75–6 mm. diametro, internodiis circiter 2·5–8 cm. longis. *Folia* petiolata, petiolo 0·7–1·5 cm. longo supra sulcato subtus rotundato more ramulorum vestito ; lamina firme chartacea vel subcoriacea, oblonga usque oblongo-lanceolata, apice acute acuminata acumine circiter 0·5–1·5 cm. longo, basi acute cuneata et in petiolum attenuata, 13–26 cm. longa, 3·8–9 cm. lata, supra glabra siccitate atro-brunnea vel nonnunquam brunnea, subtus pallidiora et grisea vel olivacea vel pallide brunnea, in costa et nervis lateralibus minutissime puberula (sub lente valido visa), aliter glabra, costa et nervis lateralibus utrinsecus 8–11 supra anguste canaliculato-impressis subtus prominentibus et plus minusve atropurpureis vel griseo-purpureis, venis traversis supra subtusque prominulis ; stipulae in vaginam 2–4 mm. longam extra more ramulorum vestitam intus glabram subtruncatam acuminibus duobus 1–3 mm. longis coronatam cohaerentes. *Inflorescentiae* paululo supraäxillares, subsessiles, cymosae, multiflorae, congestae, circiter 1·5–2 cm. longae ; bracteolae inferiores cupulatim connatae, biapiculatae. *Flores* pentameri, albi, subsessiles vel brevissime pedicellati, pedicellis usque ad 2 mm. longis glabris ; bracteolae ultimae basim pedicelli versus insertae, oppositae vel suboppositae vel alternatae, anguste ovatae, circiter 1·5–2 mm. longae, haud connatae. *Calyx* (receptaculo incluso) campanulatus, 3 mm. longus, apice 2·5–2·75 mm. diametro, extra glaber, tubo 2 mm. longo, lobis 5 triangularibus 1 mm. longis basi 1–1·2 mm latis apice acutis vel subacutis margine ciliolatis intus glabris. *Corollae tubus* 7 mm. longus, basi 1·5–2 mm. diametro, sursum ampliatus, hinc apice circiter 3·5–4 mm. diametro, extra glaber, intus fauce et parte ampliata dense longeque villoso-barbata, inferne glabrescens ; lobi 5 reflexi ovato-oblongi, 4·5 mm. longi, 2·5–3 mm. lati, glabri, apice oblique et breviter bidentati. *Stamina* 5, fauce inserta, filamentis 3·5–4 mm. longis deorsum parce villosis ; antherae exsertae, dorsifixae, oblongo-ellipticae, 2·5–2·75 mm. longae, apice saepe minute appendiculatae. *Ovarium* biloculare, ovulis in utroque loculo 2 in placenta carnosa immersis. *Stylus* 7·5 mm. longus, gracilis, glaber, apice bifurcatus, lobis inaequalibus 1·75–2·5 mm. longis. *Fructus* pedicellis circiter 4–9 mm. longis bracteolis persistentibus suffulti, globosi vel ovoideo-subglobosi, glabri, circiter 4–6·5 mm. diametro, calyce persistenti coronati. *Semina* in quoque loculo 1, subpyramidalia, unilateraliter applanata, 4 mm. longa, 3·5 mm. lata, medio 2 mm. crassa, endospermio profunde ruminato, hinc testa fissuris angustis praedita.

GOLD COAST. Bonsu, Mar. 1926, *Mrs. R. Burnett* 73 (Herb. Imp. For. Inst., Oxon.) :—tree : vernacular name " Pi ". Begoro-Bosusu, 300 m., July 1927, *Mrs. Moor* 90 (*Gold Coast Forest Herb. No.* 329) (Herb. Kew., Herb. Imp. For. Inst., Oxon.) :—tree 9 m. high. Agyikwansu, May 1931, *S. T. Jackson junior* 2247 (Herb. Imp. For. Inst., Oxon.) :— tree about 7·5 m. high and 0·6 m. in girth ; fruits in bunches along the branches. Southern Scarp Reserve, Plot C, 420 m., July 1931, *H. W. Moor* 261 (*Gold Coast Forest Herb. No.* 2349) (Herb. Imp. For. Inst., Oxon.) :— tree 6 m. high ; young fruits in axillary clusters. Mampong Scarp, 490 m., Feb. 1933, *C. Vigne* 2748 (typus in Herb. Kew.) :—small tree 6 m. high, 0·9 m. in girth, with spreading crown, growing in secondary growth in closed forest ; flowers small, white, in axillary inflorescences. In farm, Juaso, 26 Feb. 1935, *G. K. Akpabla* 282 (Herb. Imp. For. Inst., Oxon.) :—a straight-growing tree up to 6 m. high ; flowers in axils of leaves. Ampunyase, Aug. 1936, *J. E. Andoh* 4240 (Herb. Imp. For. Inst., Oxon.) :—medium-sized tree with squared stem 0·6 m. in girth and 6 m. high : vernacular name (Ash.) " Akokurajchin ".

The particular combination of characters shown by this plant is a perplexing one and indicates how unsatisfactory are certain of the criteria used for distinguishing genera in the *Rubiaceae* ; it is not without much hesitation that I have described this plant as a *Tricalysia* rather than separated it generically. In all its features it appears to be a typical *Tricalysia* except for the important and anomalous fact that its endosperm is markedly ruminate. This distinction elsewhere in the family has usually been considered sufficient to justify a separate genus, but *T. discolor* is in my opinion so very obviously and closely related to *T. macrophylla* K. Schum., whose endosperm is not ruminate,—apparently more closely related indeed than *T. macrophylla* is to many of its other congeners—that to place the pair in different genera would surely be unnatural. I am therefore unwilling, especially as the fruits of a number of *Tricalysia* species are yet unknown, to create an additional artificial genus which would lack facies and whose solitary diagnostic character would be observable only by an examination of ripe seeds. When a much needed revision of *Tricalysia* is made, it may be possible to split the genus more naturally, but this may more properly be left to the monographer.

The ruminate endosperm of *T. discolor* suggests comparison with the genus *Galiniera* Del., but the new species differs clearly in the longer corolla tube, in the glabrous, subfiliform style-branches which are neither dilated nor shortly hairy outside, and in having the ovules immersed in the placenta.

It is convenient here to deal with a nomenclatural matter affecting *Tricalysia macrophylla*. The name *Tricalysia pluriovulata* K. Schum. ex Hoyle in Check-lists For. Trees & Shrubs Brit. Emp., No. **3** (Draft of Gold Coast Check-list), 119 (1937) has unfortunately crept into literature. *T. pluriovulata* K. Schum. was an unpublished manuscript name applied to *Zenker* 1569, from the Cameroons, one of the two type-numbers of *T. macrophylla* K. Schum. in Engl. Bot. Jahrb. **28**, 66 (1899). The Gold Coast specimen, *Beveridge* 2943, cited by Hoyle (*l.c.*), is conspecific with *T. macrophylla*, under which *T. pluriovulata* should therefore fall into synonymy.

J. P. M. B.

HOPLESTIGMATACEAE.

Hoplestigma klaineanum *Pierre* in Bull. Soc. Linn. Par., n.s. No. 14, 116 (1899).

NIGERIA. Without collector's name or precise locality but probably from Oban District, *Forest Herb., Ibadan No.* 987 (Herb. Imp. For. Inst., Oxon.).

Distr. Gaboon. Now recorded from Nigeria and the area of the Fl. W. Trop. Afr. for the first time. The specimen cited above is only in fruit, but agrees well with *Klaine* 2043 from the Gaboon. There are only two species known of this very remarkable genus, the one mentioned above and *H. pierreanum* Gilg from the Cameroons.

J. P. M. B.

APOCYNACEAE.

Alafia grandis *Stapf* in Thiselton-Dyer, Fl. Trop. Afr. **4** sect. 1, 196 (1902).

NIGERIA. Ogoja Province, Ikom District : Ikom, 21 Feb. 1943, *T. F. Betts, Forest Herb., Ibadan No.* 6905 (Herb. Imp. For. Inst., Oxon.) :—climber (sent with rubber specimen).

Distr. Cameroons. The above is a new record for Nigeria and the area of the Fl. W. Trop. Africa. A striking species with leaves remarkably large for the genus. The flowers of the Nigerian specimen are very mouldy and it is poor, but sufficient to leave no doubt of its identity with *Alafia grandis*, with the type-specimens of which at Kew, collected by Zenker and Staudt, it agrees well.

J. P. M. B.

A NEW SPECIES OF CAREX.

E. NELMES

Carex coriogyne *Nelmes*, sp. nov.; affinis *C. muricatae* L., sed spicis paucioribus, squamis multo longioribus ovato-lanceolatis, utriculis latioribus ovato-ellipticis, praecipue differt.

Rhizoma caespitosum. *Culmi* 25–40 cm. alti, stricti, triquetri, sursum scabri, ad basin vaginis fuscis dissolutis obtecti. *Folia* culmo breviora, 2–3 mm. lata, plana, pallide viridia, inferiora interdum recurva. *Spicae* 3–4, androgynaeceae, pauciflorae, contiguae vel subdistantes, simplices, subebracteatae, inflorescentiam oblongam 2–2.5 cm. longam formantes. *Squamae femineae* 4–4.5 mm. longae, 1.8–2 mm. latae, ovato-lanceolatae, apice acutae vel subacutae, carinatae, mucronulatae, albido-brunneae. *Utriculi* 4.5–5 mm. longi, 2.75–3 mm. lati, late ovato-elliptici, plano-convexi, demum squarrosi, glabri, nitidi, pallide virides, dorso paucinerves, ventre enerves, marginati, marginibus superne scabri, in rostrum latum circiter 0.75 mm. longum scabrum bidentatum (dentibus strictis tenuissimis 0.5 mm. longis) abrupte contracti. *Nux* circiter 3 mm. longa et 2.5 mm. lata, ovato-orbiculata. *Stigmata* 2.

TURKEY. Lydia; Smyrna, Mt. Takhtali, 26 May 1906, *Bornmüller* 10,106.

ON THE RELATIONSHIPS OF LANNEA BARTERI *(OLIV.) ENGL.*

A. C. HOYLE AND THE LATE A. P. D. JONES.

The type specimen of *Lannea barteri* (Oliv.) Engl. (*Odina barteri* Oliv.), Nupe, *Barter* 1109, in the Kew Herbarium, consists of two sheets, on one of which are mounted somewhat immature, detached leaves and part of a branchlet with inflorescences and a leaf-bud but without developed leaves, and on the other a fascicle of inflorescences and a single detached leaf. The indumentum on the very young leaves of the leaf-bud and on the inflorescences (on both sheets) is a characteristic, floccose, pale salmon-coloured or brownish tomentum entirely composed of long-armed, crispate-stellate hairs. On the other hand, the detached leaves (on both sheets) are pubescent on the upper surface and densely pubescent on the lower surface, with simple erect or spreading hairs among which a few, relatively short-armed, stellate hairs are scattered. The difference between these two kinds of indumentum is striking, and it is surprising that hitherto no doubts seem to have been expressed about the homogeneity of the type.

During an expedition to the Anglo-Egyptian Sudan (1938-39) one of us (A.C.H.) had abundant opportunity to study the dry-zone species of *Lannea* in country whose vegetation is very similar to that of much of Northern Nigeria where Barter collected his material. Two species of this genus occur commonly in the extensive savanna woodland on the " ironstone " soils of the south-western Sudan, especially in the area, familiar under the name of " Djur-land," where Schweinfurth collected. These two species were readily distinguished from a considerable distance in the field by characters of the bark and habit (which are described in detail in the citation of notes below and illustrated in Plates 1 and 2); they were at the time given the provisional appellations "*Lannea* No. 1" (with dark, rough bark) and " *Lannea* No. 2 " (with light grey bark showing a spiral twist). These trees occur separately or together, but were nowhere seen in flower at the same time and place, "*Lannea* No. 1" opening its flowers some ten days to a fortnight earlier than the other under the same conditions. It was found impossible to collect inflorescences and fully-developed leaves from the same individual tree at the same time, because both species flower when the leaves are still in the bud or only partially developed. Hundreds of trees were seen, and there was considerable variation from place to place in the flowering-time of both species.

Careful collections were made from both species on several occasions, full notes were made, and the trees were photographed separately and together. When the leaves and inflorescences, thus reliably correlated, were compared with *Odina barteri* Oliv., it was found that the indumentum of the leaf-buds on the branchlet of *Barter* 1109, already referred to, agreed with "*Lannea* No. 1," while the indumentum of the detached leaves agreed with " *Lannea* No. 2." There is therefore no doubt that the type of *Odina barteri* is a mixture, and that the detached leaves were taken from an individual plant belonging to a different species from that which furnished the flowering branchlet. There is no evidence that Oliver suspected a mixture when he described *Odina barteri* in the Flora of Tropical Africa **1,** 446–7 (1868), and it is clear that the description was drawn up from the two specific elements composing the type cited by him. The description is not based predominantly on either of these elements.

It has already been explained that the two species frequently occur together in the Sudan, and may be expected to do so in similar country elsewhere. The mixture described above is therefore not very surprising, especially as it occurred in the early days of collecting in Africa, when correlation of material was not always precise. The different flowering-times and the fact that both species flower when leafless or with only very young leaves, would tend to make the collection of such a mixture or the subsequent mixing of specimens even more likely. What is more surprising is that in comparatively recent times, mixtures of these two species have repeatedly been made. Sometimes the branchlets and inflorescences of "*Lannea* No. 1" have been mixed, following Barter's example, with the leaves of "*Lannea* No. 2," or branchlets and inflorescences of both species have been mounted together. In other cases the branchlets and inflorescences of "*Lannea* No. 2" have been mixed with the leaves of "*Lannea* No. 1."

In view of the fact that *Odina barteri* was based on a mixed specimen and that the subsequent interpretation of this species has been similarly confused (probably due in part to the original mixture), we propose that *Lannea barteri* (Oliv.) Engl. (*Odina barteri* Oliv.) be rejected as a *nomen confusum* under Article 64 of the International Rules.

The identity of the two specific elements composing the mixture will now be considered.

The branchlet and inflorescences of *Barter* 1109 and eight specimens of "*Lannea* No. 1" collected by Hoyle from eight separate trees in various parts of the Sudan, all agree with the description of *Lannea schimperi* (Hochst. ex A. Rich.) Engl. (*Odina schimperi* Hochst. ex A. Rich. Tent. Flor. Abyss. **1,** 140 : 1847), and with *Schimper* 657 and 1282, quoted by Richard, duplicates of which are deposited in the Kew, British Museum and Fielding (Oxford) Herbaria. *Lannea schimperi* is an addition to Hutchinson and Dalziel's Flora of West Tropical Africa ; citations of specimens seen are given at the end of this paper. It has further come to our notice that *Lannea stolzii* Engl. et v. Brehm., of which isotypes (*Stolz* 1570, 1603 and 1638) are deposited in the Kew and Oxford (Imperial Forestry Institute) Herbaria, is conspecific with *L. schimperi.*

The correct identity of "*Lannea* No. 1" (= the flowers of *Lannea barteri*) having thus been established, there remained the problem of identifying "*Lannea* No. 2" (= the leaves of *Lannea barteri*). The leaves of *Barter* 1109 and three specimens of "*Lannea* No. 2" collected by Hoyle from three separate trees in the Sudan, were found to agree excellently with *Lannea kerstingii* as described by Engler and Krause (Engl. Jahrb. **46,** 325 : 1912) on the basis of two specimens, *Kersting* 68a from Sokode in Togo and *Chevalier* 521 from "Onassaïn"* in French Sudan. Comparison with

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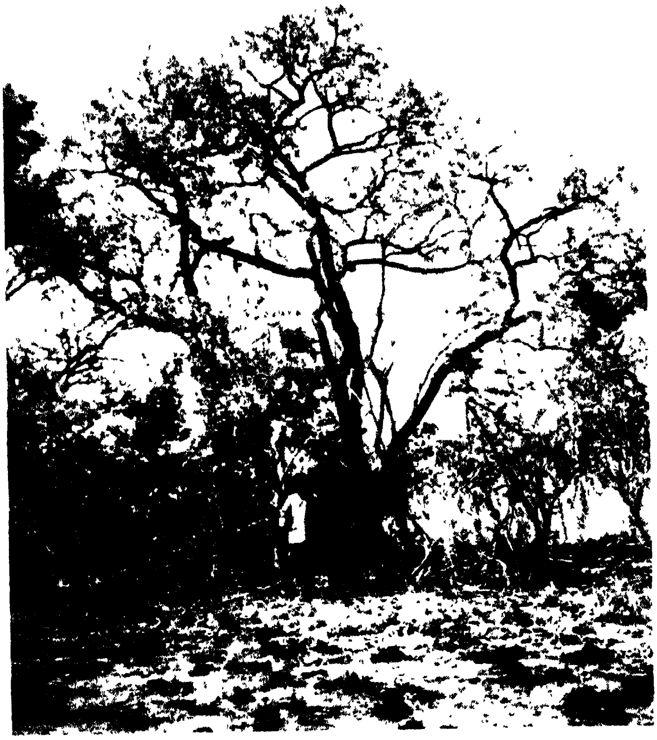
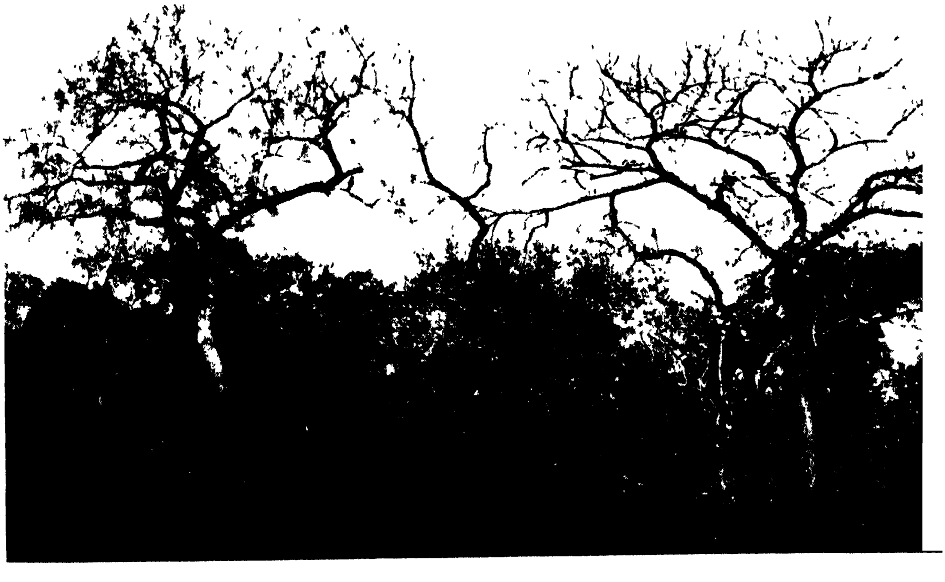
* See footnote below citation, p. 83.

PLATE 1



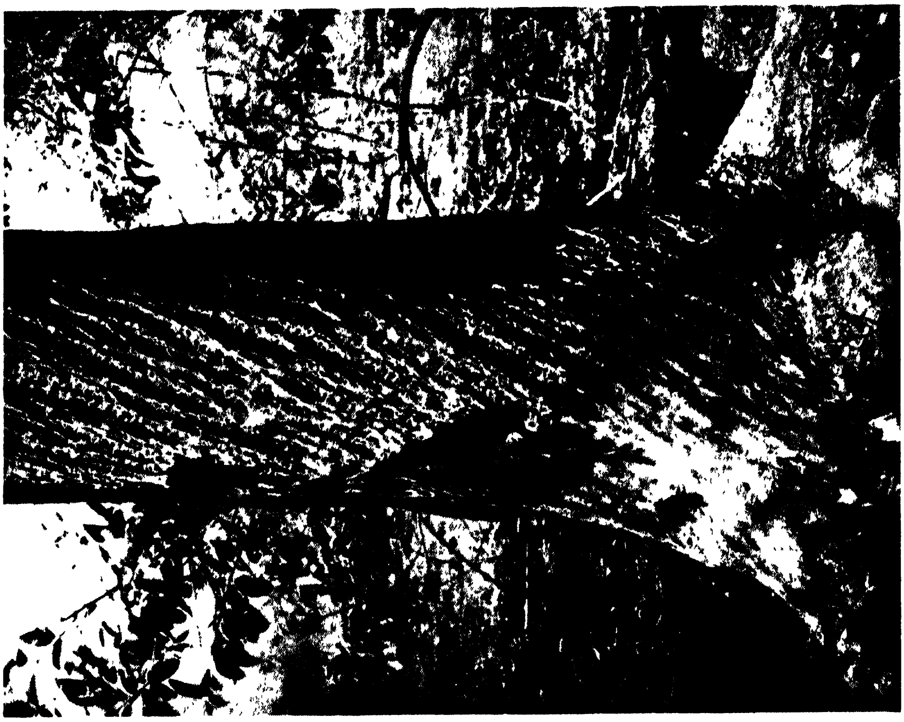
L. schimperi (Photo S.261 of *Hoyle* no. 585)



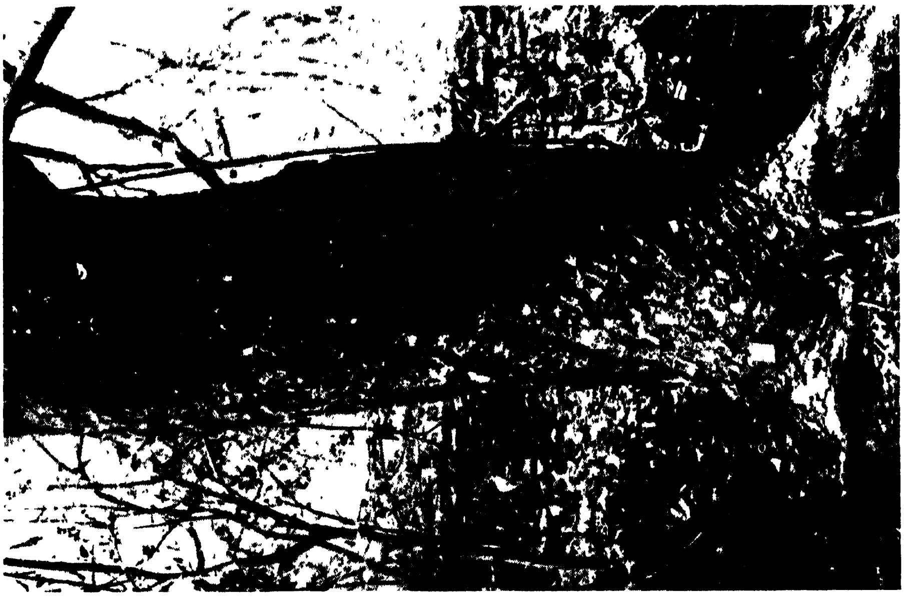
L. schimperi (left) and *L. kerstingii* (right)
(Photo S.259; tree on right is *Hoyle* no. 586).

Photos

PLATE 2



L. kerstingii Photo S.262 of *Hoyle* no. 586).



L. schimperi (Photo S.263 of *Hoyle* no. 585).

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Kersting 68a was at the time (1945) impossible, and unless a duplicate was distributed from Berlin, this gathering is probably now lost for ever. By the courtesy of the Director of the Muséum Nationale d'Histoire Naturelle in Paris, and the collaboration of Professor F. Pellegrin, we were able to have a specimen compared for us with *Chevalier* 521. Professor Pellegrin, to whom we sent leaflets of "*Lannea* No. 2" (under the name of *L. barteri*) and of *Lannea velutina* A. Rich. (the only other species with which, so far as we know, the leaf-indumentum can be confused), writes as follows :—"*Lannea* : Le No. 521 de Chevalier, type du *L. Kerstingii* de la main d'Engler est sans aucun doute un *L. Barteri.* Quant au No. 9753 Chevalier, type du *L. sessili-foliolata,* c'est un échantillon très insuffisant, en feuilles seulement, et donc les folioles ont exactement l'indumentum du *L. Barteri,* lui aussi. Rien de commun avec le *L. velutina.*" This determination not only establishes that "*Lannea* No. 2" and the leaves of *L. barteri* are both conspecific with *L. kerstingii* Engl. and Krause, but also disposes of the inadequately-known *L. sessilifoliolata* Engl.

DESCRIPTION AND IDENTIFICATION OF MIXED MATERIAL.

1. In Kew Herbarium.

NIGERIA : Nupe, *Barter* 1109. Sheet 1 : flowering branchlet = *L. schimperi* ; foliage = *L. kerstingii.* Sheet 2 : detached fascicle of inflorescences = *L. schimperi* ; foliage = *L. kerstingii.*

NIGERIA : Katagum District, *Dalziel* 225. Sheet 1 : several short branchlets bearing fruiting and aborted inflorescences = *L. schimperi.* Sheet 2 : one short piece of branchlet bearing inflorescences = *L. kerstingii* ; foliage = *L. kerstingii.*

NIGERIA : Agaie, *Yates* 61. One sheet only : one detached fascicle of inflorescences = *L. kerstingii* ; one branchlet with broken leaf-rhachides and two detached leaves = *L. schimperi.*

NIGERIA : Bauchi Plateau, *Lely* P.159. One sheet only : two branchlets with male and female inflorescences respectively = *L. schimperi* ; detached leaflets = *L. kerstingii.*

Note.—This number (*Lely* P.159) in Lely's own Herbarium in the Imperial Forestry Institute Herbarium, has on one sheet two branchlets bearing respectively male and female inflorescences = *L. schimperi,* and one detached leaf =*L. schimperi.*

2. In the British Museum Herbarium.

UGANDA : Unyoro, near Masinde, *Bagshawe* 880. Sheet 1 : leaves and flowers = *L. schimperi.* Sheet 2 : leaves and fruits = *L. kerstingii.* Both sheets are dated January.

3. In Lely's Herbarium in the Imperial Forestry Institute Herbarium, Oxford.

NIGERIA : Bauchi Plateau, *Lely* P.158. One sheet only : one branchlet with female inflorescences = *L. schimperi* ; one detached leaf = *L. schimperi* ; three branchlets bearing female inflorescences, from bud-stage to young fruiting stage = *L. kerstingii.*

It is clear that in some cases these mixtures have occurred because the collector gathered his material from more than one tree, and communicated the whole under one number. In other cases it seems more probable that the origin of the mixture is to be sought in mounting. The latter was almost certainly the cause with *Dalziel* 225, where only two detached inflorescences of *L. schimperi* were mounted on a sheet otherwise unmixed *L. kerstingii*, while *Dalziel* 186 is also unmixed.

The relationship between *L. schimperi*, *L. kerstingii* and *L. velutina* will now be considered in greater detail. With the large amount of material now available for study, it is possible to devise a practical key to the fruits and to the leaves independently. Either of these keys can be used with some confidence to distinguish the three species from the young fruiting stage until the leaves fall. The shape and number of leaflets are too variable to be reliably used as diagnostic characters, and are therefore omitted.

KEY USING MATURE FRUITS AND BARK ONLY. (*See* Plates 2 and 3).

Fruit more or less densely velutinous with simple hairs, with or without a few scattered stellate hairs ....*L. velutina*

Fruit glabrous:

Fruit obliquely or irregularly ovoid or suborbicular, smooth when fresh, markedly rugose when dry, 7–9 mm. in diameter; fruit-stalk 2 mm. long or less, jointed above the middle, so that the detached fruit is very shortly stalked ; bark rough, dark grey or black ....*L. schimperi*

Fruit ovoid-oblong, laterally flattened, especially toward the apex, 9–13 × 7–8 mm., regular or with the apex rather obliquely truncate, smooth (not rugose) when dry, brown with a glaucous bloom ; fruit-stalk 4–5 mm. long; bark relatively smooth, light grey, usually spirally grooved....*L. kerstingii*

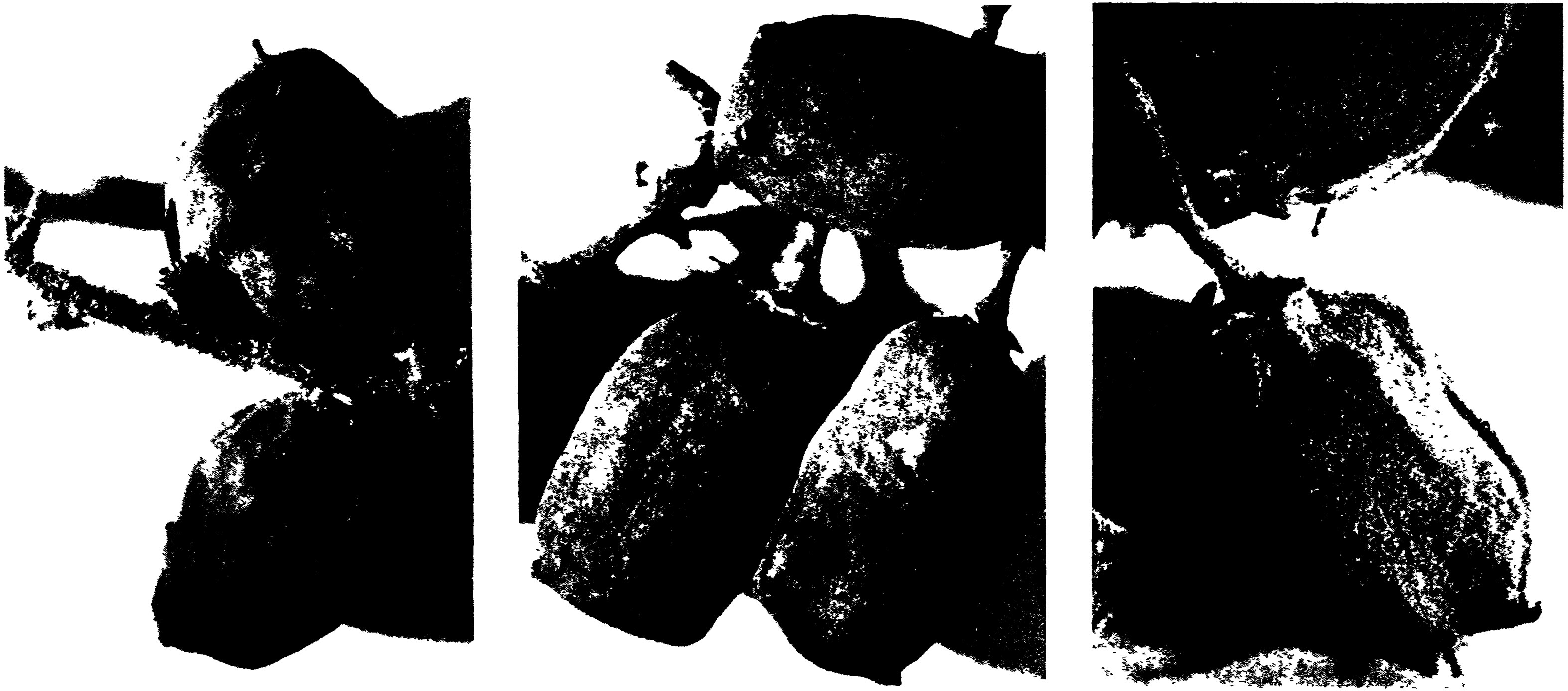
KEY USING LEAVES ONLY (at fruiting stage or older; *see* Plate 4).

Indumentum of leaflets floccose, pinkish, salmon-coloured or reddish-ferruginous, composed of long-armed, weak, crispate-stellate hairs only, which are early caducous and have largely disappeared from the upper surface in the mature fruiting stage, but remain densely matted beneath, concealing the lower surface .... *L. schimperi*

Indumentum of leaflets velutinous, persistent on both surfaces, greenish brown or grey to whitish yellow or tawny, composed of simple hairs and stiff, non-crispate, short-armed, stellate hairs :

Margin of leaflets stellate-tomentose, with fewer simple hairs intermingled but inconspicuous; lower surface closely and prominently areolate, densely velutinous, with long, whitish, simple hairs spreading from the veins, filling the areolae and concealing the surface ; tawny stellate hairs conspicuous among the short simple hairs on the upper

PLATE 3



L. schimperi
(*J. Smith* no. 12).

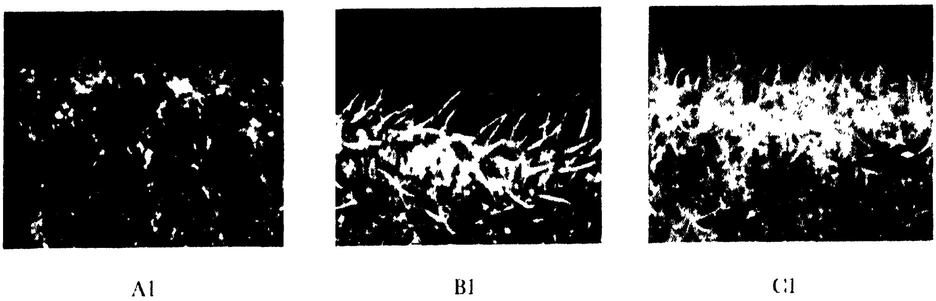
L. kerstingii.
Hoyle no. 682).

L. velutina.
(*C. Vigne* no. 3788).

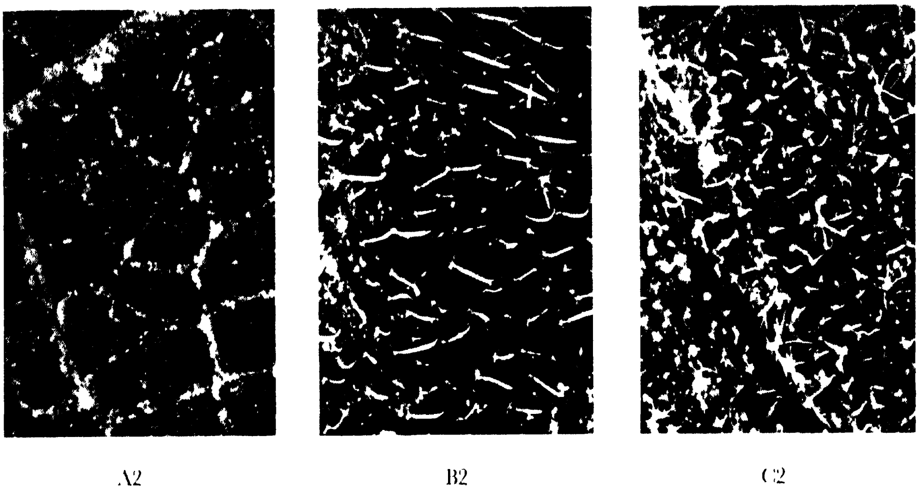
Dried fruits of three species of *Lannea.* × 4.

Photos.—L. Clinkard.

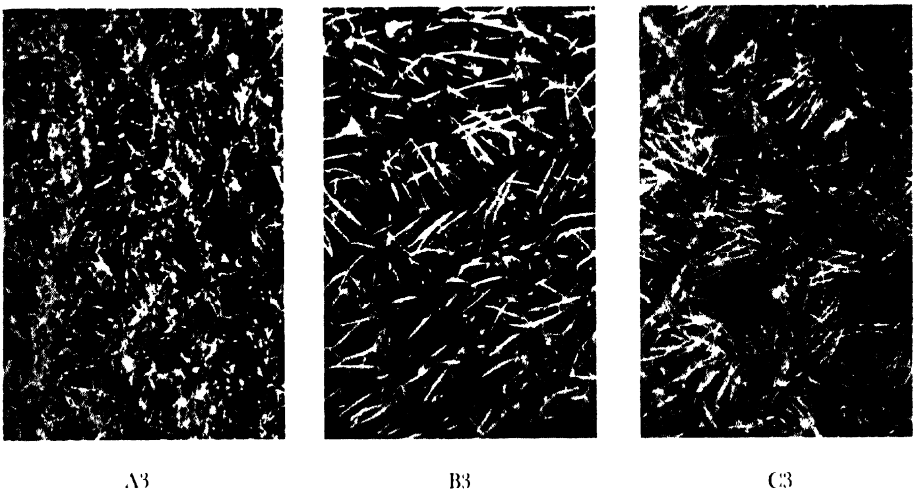
PLATE 4



Part of margin seen from above.



Part of upper surface.



Part of lower surface

A *L. schimperi* (*J. Smith* 12). B *L. kerstingii* (*C. Vigne* 3915). C *L. velutina* (*C. Vigne* 3788).

Leaf-indumentum of three species of *Lannea*. 20.

Photos L. Clinkard.

To face page 79.

surface, on the veins on the lower surface, and especially on the margin .... *L. velutina*[*]

Margin of leaflets ciliate with rather long simple hairs and a very few stellate hairs; lower surface openly and not prominently reticulate, the surface easily visible between the erect and spreading simple hairs; tawny stellate hairs few and inconspicuous on both surfaces and on the margin *L. kerstingii*[*]

The leafless flowering or sterile branchlets of *L. schimperi* can be distinguished from those of the other two species by having, on the leaf-buds and inflorescences, the pinkish or reddish-ferruginous indumentum of long-armed, shaggy stellate hairs only. The female inflorescences of *L. velutina* may be distinguished from the female inflorescences of *L. kerstingii* by the tomentose ovary in the former, the ovary of the latter being quite glabrous. The male inflorescences of these last two species cannot be reliably distinguished except by very careful comparison with authentically-named flowering specimens having leaves of sufficient age attached or reliably correlated. It is evident that the differences between *L. velutina* and *L. kerstingii* are less important and less fundamental than those which distinguish both these species from *L. schimperi*. It is also known from numerous field notes (below) that the bark and habit of *L. schimperi* and *L. kerstingii* are strikingly different (Plates 1 and 2). Unfortunately, none of the eight collectors of *L. velutina*, whose specimens have been examined, has furnished any information of diagnostic value about the habit of this species, and none has even mentioned the bark.

The distribution of the three species is interesting. *L. velutina* seems to be confined to a comparatively small part of West Tropical Africa, having been collected, as far as known, only from Senegal, the Gambia, French Sudan, Portuguese Guinea and northern Gold Coast. *L. kerstingii* has been collected from French Sudan, the Ivory Coast, the Gold Coast, Togoland, Nigeria, northern Cameroons, the Anglo-Egyptian Sudan and Uganda, but does not seem to spread further east or south. *L. schimperi* occurs in Senegal, and ranges from Nigeria and the Cameroons through the Ubangui-Shari-Chad, the Anglo-Egyptian Sudan, Abyssinia, Uganda and Kenya to Tanganyika Territory. It appears to extend further into parts of Nyasaland and Northern Rhodesia. Here, however, it comes into the area of distribution of the closely-related South African species (or subspecies ?) *L. discolor* (Sond.) Engl., and specimens of intermediate character occur, so that not only more thorough examination of material but also considerably fuller and more precise field notes are required before definite conclusions can be drawn about relationships and distribution in these south-eastern regions.

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[*] *Note.*—A lens with a magnification × 15 is necessary adequately to resolve the indumentum of these two species, which are difficult to distinguish on the very young leaves, because the simple hairs of *L. kerstingii* are then more closely set and the stellate hairs approach in frequency those of the fruiting stage of *L. velutina*.

CITATION OF MATERIAL AND FIELD NOTES SEEN, AND OF TYPES RECORDED.

(Note : Herb. I.F.I. = Imperial Forestry Institute Herbarium.)

L. schimperi (*Hochst. ex A. Rich.*) *Engl.*

SENEGAL. *Boivin* s.n. (Herb. Kew!).

NIGERIA. Abinsi, *J. M. Dalziel* s.n. (Herb. Mus. Brit. ! ex Edinb.); Maska, 20 miles north of Zaria, *Foster* 9 (Herb. Kew !) fl. 9 Feb. 1915. Sokoto Province : Zamfara Forest Reserve and neighbourhood, about 9 miles E.S.E. of Zurmi at foot of Dutsen Bagai, *R. W. J. Keay, For. Herb., Ibadan No.* 16184 (Herb. I.F.I., Oxon. ! ex Ibadan) young leaves and fruits, 29 April 1946. Zaria Province : Basawa Communal Forest Area, about 8 miles N.W. of Zaria, *R. W. J. Keay, For. Herb. Ibadan, No.* 16108 (Herb I.F.I., Oxon. ex Ibadan), young and old leaves and frts. (some in spirit), 7 April 1946. Bauchi Province: *Conservator of Forests* in *Herb. I.F.I. No.* 2663 (Herb. I.F.I., Oxon. !), male inflors. on leafless branchlets, no date ; Ado, *Rowland* s.n. (Herb. Kew !) inflors. only. Eastern Provinces : Enugu Forest Reserve, *J. Smith* 12 (Herb. I.F.I., Oxon. !) young fruit, Nov. 1928; Enugu, 700 ft. alt., *Cons. of Forests* 48 (Herb. I.F.I., Oxon. !) frt. and young leaves, 13 March 1926; Enugu Forest Office, 650 ft. alt., *Cons. of Forests* 49 (Herb. I.F.I., Oxon !) male fls. and semi-mature lvs., 26 Feb. 1926 ; Abakaliki, 600 ft. alt., *Cons. of Forests* 123 (Herb. I.F.I., Oxon. !), male flowers and semi-mature lvs., May 1926.

CAMEROONS. Sansana-Kongola, 5° 30′—6° N., 13° 45′—14° E., 750–800 m. alt., *Mildbraed* 8977 (Herb. Kew ! ex Berlin), mature lvs. only, April 1914; Buar, 6° N., 15° 35′ E., c. 1,000 m. alt., *Mildbraed* 9489 (Herb. Kew ! ex Berlin), mature lvs., no date. Cameroons, no precise locality, *Mildbraed* 10105 (Herb. Kew ! ex Berlin).

UBANGUI-SHARI-CHAD. East Shari : " Pays de Snoussi," Ndelle, c. 8° 25′ N., 20° 32′ E., *A. Chevalier* 7617 (Herb. Kew !), fl. 27 Feb. 1903.

ABYSSINIA. Tigre, *Capt. Pullen* 566 (Herb. Kew !), frt. June. Shoa, *Schimper* 1282 (Herb. Kew !, Herb. Mus. Brit. !, Herb. Fielding, Oxon. !), type of male fls. ex num., 21 March 1840. Jelajerane (" Dscheladscheranne "), *Schimper* 657 (Herb. Kew !, Herb. Mus. Brit. !), type of female fls. and fruit ex num., June. Gobelli Valley, 5,000 ft. alt., *J. B. Gillett* 5263 (Herb. Kew !), frt., March, 1933.

ANGLO-EGYPTIAN SUDAN.- Red Sea Province: Erkowit, *Mrs. Crowfoot* s.n. (Herb. Kew !), a fragment, frt. March. Kassala Province : Gallabat neighbourhood, *Schweinfurth* 1276 (Herb. Kew ! , Herb. Mus. Brit. !), frt. June. Nuba Mts. Province: El Geybish, *N. D. Simpson* 7781 (Herb. Kew !). Southern Kordofan Province: Jebel-el-Daier, *J. Longe* 59 (Herb. Kew !). West Equatorial Province: Western District, near a tributary of the Boro River, between Jebel Manda and the source of the Boro, *Hoyle* 513 (Herb. I.F.I., Oxon. !), young frt. and young lvs., 24 Jan. 1939; Raga-Said Bundas Road, Minamba Rest House, near Ringi Hills, *Hoyle* 441 (Herb. I.F.I., Oxon. !), female fls. and very young lvs., 18 Jan. 1939; west of village just west of the crossing of the Kuru River on the Wau-Raga Road, *Hoyle* 545 (Herb. I.F.I., Oxon. !), male fls.

and young lvs., 31 Jan. 1939. Aweil District, Aweil-Nyamlell Road, c. 10 miles from Aweil, *Hoyle* 600 (Herb. I.F.I., Oxon. !), male inflors. on leafless branchlets, 14 Feb. 1939; same road, c. 3 miles from Aweil, 1 mile S.W. of Mapare Village, *Hoyle* 612 (Herb. I.F.I., Oxon. !), male inflors. on leafless branchlets, 15 Feb. 1939 ; near the last, *Hoyle* 613 (Herb. I.F.I., Oxon. !), male inflors. on leafless branchlets, same date. Wau District, Wau–Chak Chak Route, Khor Bom, *Broun* s.n. (Herb. Kew !), young frt. March ; Nyin Akok, *Turner* 111 (Herb. Kew !), frt., 21 Feb., 1935 ; Ngowlima, 15 miles S.W. of Wau, ridge north of Rest House, *Hoyle* 567 (Herb. I.F.I., Oxon. !), male inflors. in bud, on leafless branchlets, 6 Feb. 1939 ; Wau–Meshra Road 4–6 miles from Wau, long slope by road, *Hoyle* 585 (Herb. I.F.I., Oxon. !), male inflors. on leafless branchlets, 7 Feb. 1939. South-west Equatorial Province : Lado, Yei River, *Sillitoe* 332 (Herb. Kew !). " Bahr-el-Ghazal," no precise locality, *Broun* 916 (Herb. Kew !).

UGANDA. Northern Province: Chua District, Kitgum–Aswa River Road, *W. J. Eggeling* 855 (Herb. Kew !), fl., no date. West Nile District, Pyeda, 4,500 ft. alt., *Tothill* 2591 (Herb. Kew !); Uleppi, *Eggeling* 1955 (F. D. 1578) (Herb. Kew !, Herb. Mus. Brit. !, Herb. I.F.I., Oxon. !), young frt., March. Western Province : Ankole District, Gayaza, Ruamfara, 4,750 ft. alt., *Eggeling* 631 (Herb. Kew !), frt., Oct. Eastern Province: Karamoja District, Timu Area, *Brasnett* 110 (Herb. Kew !), young frt., no date. Teso District, Serere, 3,600 ft. alt., *Chandler* 656 (Herb. Kew !), fls. March. Bugishu District, Bukonde, Mt. Elgon, 4,000–5,000 ft. alt., *Snowden* 851 (Herb. Kew !, Herb. Mus. Brit. !), young frt., March. Buganda Province: Mubende District, Bukomero, Singo, *Eggeling* 486 (Herb. Kew !), fls., August. Province ? District ? Buweguzo, 3,500 ft. alt., *Snowden* 223 (Herb. Kew !, Herb. Mus. Brit. !), frt., no date; Mpogo, c. 4,000 ft. alt., *Dümmer* 4373 (Herb. Kew !), fls., Jan. Without locality, *Eggeling* 1161, 1643 (Herb. I.F.I., Oxon. !); *H. R. Webb* 48 (Herb. I.F.I., Oxon. !), male fls. and detached old lvs., March 1938. Western Province: Ankole, *Bagshawe* 267, type of *L. rufescens* Engl. var. *bijuga* Bak. f., probably belongs here, fide *Eggeling,* Indigenous Trees of Uganda, 5 (1940).

KENYA COLONY. Mount Elgon, 6,000 ft. alt., *I. R. Dale* F.D. 3204 (Herb. Kew !, Herb. I.F.I., Oxon. !), branchlets, young frts. and young lvs., March 1934.

TANGANYIKA TERRITORY. Bukoba Province : Bukoba District, Sunssu, Karagwe, *H. Gillman* 145 (Herb. Kew !), fls. and young and old lvs., 13 Sept. 1934. Central Province : Kondoa District, Sambala, 4,900 ft., *B. D. Burtt* 2160 (Herb. Kew !), inflors. on leafless branchlets. Dodoma District, Mpwapwa, 3,500 ft., *H. E. Hornby* 407 (Herb. Kew !), fls. and detached mature lvs., 3 Jan. 1932. Tanga Province : West Usambaras, Makuyuni district, *Koritschoner* 1530 (Herb. Kew !), frts. and mature lvs., no date. Iringa Province : Mbeya District, Mbozi, *V. F. Jessel* 47 (Herb. Kew !), frt. and young lvs., no date. Rungwe District (" Kyimbila "), Massoko, *Stolz* 1008 (Herb. Kew !), young infructescences and part of young leaf, 27 Nov. 1911; same district, without precise locality, *Stolz* 1570, fls., frts. and fragments of young lvs., 1603, frts. and young leaves, 1638, frts. and semi-mature lvs., types of *L. stolzii* Engl. et v. Brehm. ex num. (all in Herb. Kew ! and Herb. I.F.I., Oxon. !). Iringa District (?), Tanangosi, 5,300–5,800 ft. alt., *Dr. Gordon Brown* H54/33/9 (Herb. Kew !), fls. and young lvs., 30 Nov. 1933.

BELGIAN CONGO. Urundi, in a valley of one of the rivers running into the Ranzigirra Lake, *von Trotha* 71 (Herb. Berol. ?, not seen), sterile, with young and old lvs., Sept., type of *L. rufescens* Engl., probably belongs here, e descript.

FIELD NOTES.

Flowers: the common, early-flowering species (*Hoyle* 612); buds yellowish green (*Hoyle* 567); spikes pale greenish yellow (*Hoyle* 441); greenish golden yellow (*Hoyle* 600); yellow just before falling (*Hoyle* 545); spikes pendulous (*Hoyle* 585); bright yellow (*Eggeling* 486); yellow (*Eggeling* 855); yellow, preceding leaves (*Chandler* 656); yellow, fragrant (*Dümmer* 4373); pink* (*Webb* 48); reddish* (*H. E. Hornby* 407).

Fruits: (young) pale green (*Keay* 16108); (unripe) red-flushed on green (*Hoyle* 513); young fruits greenish (*Snowden* 851); ripening fruit pinky green (*Dale* 3204).

Foliage: young leaves pinkish buff-coloured (*Hoyle* 441); pink-tomentose, soon turning light green above (*Hoyle* 545); pinkish when young (*Snowden* 851, *Brasnett* 110).

Bark: dark grey, rather rough (*Turner* 111); dark brown, deeply fissured (*Keay* 16184); darkish grey, rough, exfoliating slowly in rectangular scales (*Hoyle* 585); nearly black, rough, scaly (*Hoyle* 600); dark, rough, longitudinally fissured and square-reticulate, inner bark yellow-white, soft, not stringy (*Hoyle* 612); bark more striate than 612, and inner bark more stringy, " may be only natural variation or younger tree " (*Hoyle* 613); bark light grey, blaze white (*Webb* 48); smooth, grey (*H. E. Hornby* 407); grey (*Dale* 3204).

Habit: tree (*Webb* 48); small tree (Enugu, *J. Smith* 12, Lagos, *Rowland* s.n., *Eggeling* 486, *B. D. Burtt* 2160, *Hoyle* 513); low tree 6–8 ft., widely few-branched (*Hoyle* 441); bole usually short (*Turner* 111); small, spreading-crowned tree (*Hoyle* 545, 600); tree 10 ft. (*Keay* 16108); small tree 13 ft. (*Dale* 3204); straggling tree to 15 ft. (*Brasnett* 110); tree 15 ft. (*Eggeling* 631, *H. E. Hornby* 407); tree 15 ft. by 18 in. girth (*Keay* 16184); tree 10–20 ft. (*Snowden* 851); small tree to 20 ft. (*B. D. Burtt* 2160) ; tree 20–25 ft. (*Chandler* 656); rather slender tree with spreading crown (*Hoyle* 585); deciduous tree 30 ft. (*Dümmer* 4373); usually 15–25 ft. high (general notes with *Hoyle* 545, 585); tree to 50 ft. (general note with *Cons. of Forests, Enugu* 48, 49 and 123).

Habitat: in savanna (Enugu, *J. Smith* 12); on poor lateritic soil throughout the savanna forests (general note with *Cons. of Forests, Enugu* 48, 123); on moderate red earth soil (*Cons. of Forests, Enugu* 49); in lower storey of open part of *Isoberlinia doka* woodland (*Hoyle* 545); on broken ironstone soil (*Hoyle* 567); long slope on ironstone soil (*Hoyle* 585); in *Isoberlinia* savanna pollard regrowth (*Keay* 16108); in open savanna woodland with *Bauhinia reticulata*, *Sterculia setigera*, *Lannea acida* and *Balanites* (*Keay* 16184); in mixed dry deciduous savanna woodland with *Anogeissus schimperi*, *Pterocarpus abyssinicus*, *Terminalia macroptera* and *Combretum spp.*, between edge of ironstone and *Anogeissus* woodland (*Hoyle* 600); in dry deciduous " ironstone " savanna woodland (*Hoyle* 612, 613) ; on rocky hillside (*Eggeling* 631); in open country with scattered trees (*Tothill* 2591); on rocky outcrops (*Dümmer* 4373); common in *Berlinia* (=*Isoberlinia*)—*Brachystegia* woodland (*B. D. Burtt* 2160); in gravelly soil on hillside, fairly common (*H. E. Hornby* 407); in savanna with *Combretum splendens*, *Acacia seyal*, etc., to be found from Eldoret to Koru and to Mt. Elgon, not common (general note on *Dale* 3204); dry conditions, sandy loams, *Combretum*—*Acacia*—*Themeda* (*Gillman* 145).

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* These discrepancies in flower-colour are matched by discrepancies in the description of the bark of these specimens; " pink " and " reddish " presumably refer to the indumentum, the most conspicuous feature of the young flower-spikes.

Vernacular names :

Northern Nigeria (Hausa): Faru (*Cons. of Forests, Bauchi, in Herb. I.F.I., Oxon.* No. 2663); Farun Doya (*Keay* 16184).

Tanganyika Territory (West Usambaras): Mwongo (*Koritschoner* 1530).

L. kerstingii *Engl. et Krause.*

French Sudan. Ouassaia*, *A. Chevalier* 521 (Herb. Chev.), type of flowers, 3 March 1899.

Ivory Coast. Haut Sassandra : Pays des Dyolas, Mt. Boho, near Zoanlé, *A. Chevalier* 21492 (Herb. Kew !), frt., 6 May 1909. Comoé Valley, Village of Yabarasso, *A. Chevalier* 22546 (Herb. Kew !), fls., 12 Dec. 1909.

Gold Coast. Northern Territories : Yagbung to Nabiungo, *Kitson* 745 (Herb. Kew !), lvs. only, May 1927; Wiasi, 500 ft. alt., *C. Vigne* 4484 (Herb. Kew ! Herb. I.F.I., Oxon. !), frt., March 1938; Lawra, 1,000 ft. alt., *C. Vigne* 3915 (Herb. I.F.I., Oxon. !), semi-mature lvs., May 1935. Ashanti: 7 miles north of Abofuo, 800 ft. alt., *C. Vigne* 1811 (Herb. I.F.I., Oxon. !), fls., Feb.; West Ashanti, Fiapere, *Chipp* 80 (Herb. Kew !), fl., 5 Feb. 1912.

Togoland. Near Sokode, *Kersting* 68a (Herb. Berol. ?), type of fruit.

Nigeria. Yola, *Dalziel* 178 (Herb. Kew !), branchlets, young lvs. and detached old lvs., 25 April, 1909. Kabba Province : Okene, fuelwood plantation Compt. 4a, *Symington, For. Herb., Ibadan No.* 5662! Oyo Province: Oyo District, Old Oyo Forest Reserve, ¾ mile west of R. Tessi camp on slope, in open savanna woodland, *R. W. J. Keay, For. Herb., Ibadan No.* 16262 (Herb. I.F.I., Oxon. ! ex Ibadan), ♂ fls. on leafless branchlets, bark, 13 Feb., 1946; same locality and date, *Keay, For. Herb., Ibadan No.* 16264 (Herb. I.F.I. Oxon. ! ex Ibadan), ♀ fls. and frts. on leafless branchlets, old lvs. from ground ; fls., and frts. in spirit collection (Oxon. and Ibadan); branchwood correlated.

Cameroons. Mbussa west of (?) Kunde, 6° N., 14° 20′ E., 8–900 m. alt., *Mildbraed* 9096 (Herb. Kew !), frt. end of April, 1914. North of Lom River, 13° 40′ E., 700–750 m. alt., *Mildbraed* 8913 (Herb. Kew !), frt. end of April, 1914.

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* There is a discrepancy in the spelling of this locality. Engler's description has " Onassain," while *Chevalier* (Bot., 159) is the source of the spelling used here and of the notes, quoted below, which he records as attached to *Chevalier* 521.

ANGLO-EGYPTIAN SUDAN. Nuba Mountains: Heiban, *Burnett* 15 (Herb. Kew !), fls. when leafless, 27 March, 1933. Gebel near Gebel Zerâf, *N. D. Simpson* 7706 (Herb. Kew !), young lvs. only, 1 April, 1930. Blue Nile, Khor Dahat, *G. Aylmer* 9 (Herb. Kew !), fls. 2 March 1922. Wisko, *G. Aylmer* 33 (Herb. I.F.I., Oxon ! ex Herb. Sudan), mature lvs. only, 12 Dec., 1929. West Equatorial Province: Wau District, Jur River, Gereinti, *G. Aylmer* 27/49 (Herb. Kew !), old leaf only, no date; Nyin Akok, *Turner* 110 (Herb. Kew !), fls. before lvs., 21 Feb. 1935; ridge-road, east of Jur River, from Wau–Meshra Road to Nyin Akok, 1 mile from Meshra Road, *Hoyle* 597 (Herb. I.F.I., Oxon. !), fls. and very young lvs., 10 Feb., 1939; Wau–Meshra Road 4–6 miles from Wau, *Hoyle* 586 (Herb. I.F.I., Oxon. !), fls. on leafless branchlets, 7 Feb., 1939. South West Equatorial Province: Wau–Tembura Road, by Mabou Rest House, in remnant of cleared savanna woodland, *Hoyle* 682 (Herb. I.F.I., Oxon. !), frt. and mature lvs., 7 March, 1939. "Bongoland," Gir, *Schweinfurth* 1520 (Herb. Kew !), frt., 7 April, 1869; between Dokuttu and Tsabbi, *Schweinfurth* 2807 (Herb. Kew !), fls., 15 Jan., 1870. "Djurland," Gr. Seriba Ghattas (Tonj ?), *Schweinfurth* 2078 (Herb. Kew !), mature lvs., July. Loka, Mt. Gumbiri, *Myers* 8377 (Herb. Kew !), fls., 28 Jan., 1938. Li Yabongo, *Wyld* 49 (Herb. Mus. Brit. !), frt., Feb. East Equatorial Province: Payito, 32° 40′ E., 3° 80′ (sic) N., c. 4,600 ft. alt., *Chipp* 25 (Herb. Kew !), fls. and young lvs., 6 Feb., 1929.

UGANDA. Northern Province: West Madi District, Leli, 2,500–3,500 ft. alt., *Forest Ranger Byasi* 1 (Herb. I.F.I., Oxon. !), semi-mature lvs. only, 19 March, 1945; Lango District, Lira Arboretum, *F. C. Hummell* 605 (Herb. I.F.I., Oxon. !), one old leaf, 26 Aug., 1944. Gulu District, Offu, 3,000 ft. alt., *Hancock* 752 (Herb. Kew !), frt. and detached mature lvs., no date; Aswa River, Gulu–Kitgum Road, *Eggeling* 779 (Herb. Kew !), fls. and young and semi-mature lvs., no date. Western Province: Bunyoro District, Busingiro, 3,800 ft. alt., *Harris* 78 (F.D. 643) (Herb. Kew !), frt. and detached semi-mature lvs., March; Bunyoro, *Dawe* 806 (Herb. Kew !), fls., very young frts. and old lvs., no date. Eastern Province: Teso District, Serere, c. 3,600 ft. alt., *Chandler* 581 (Herb. Kew !, Herb. Mus. Brit. !), frts., young leafy shoot and old detached leaf, March 1932; *Chandler* 582 (Herb. Kew !), fls. and young and mature lvs., March 1932.

FIELD NOTES.

Flowers: when leafless, yellow (*Vigne* 1811, *Chevalier* 521); in long, pendent, yellow spikes clustered at ends of branches (*Eggeling* 779); small, yellowish (*Chandler* 581, 582); greenish (*Turner* 110, *Myers* 8377); always later in flower than No. 585 (*L. schimperi*), buds green, in pendulous spikes (*Hoyle* 586); strongly syringa-scented (*Chipp* 25); male inflorescence-axis, flower buds and petals greenish yellow, calyx darker yellow, filaments cream, anthers yellow (*Keay* 16262); female inflorescence-axis, calyx and petals greenish yellow, ovary green tinged red above, stigmas cream (*Keay* 16264).

Fruits: (unripe) green, fleshy (*Hoyle* 682); brick-red, suffused green below (*Keay* 16264); dull purplish when ripe (*Chandler* 581).

Foliage: leaf-buds with greenish brown indumentum, leaves (old, dried) reddish brown with whitish indumentum (*Keay* 16262, 16264); mature leaves deep green above, tawny beneath (*Hoyle* 682).

Bark: white (*Chevalier* 521); smooth, silver-grey with pronounced spiral twist (*Hoyle* 586, 597); with perceptible twist invariably present (*Hoyle* 682); pale grey, lightly furrowed in spiral fashion (*Myers* 8377); grey, smooth (*Aylmer* 33); spirally striate (*Chipp* 25); shallow fissures in the light grey bark often run spirally (*Turner* 110); bark deeply fissured [old tree ?] (*Harris* 78); pale green, anastomosing fissures tending to be spiral, outer bark 4 mm. thick, brown, inner bark 10 mm. thick, very fibrous and stringy, pink with white, sap becoming dirty-bluish, sapwood cream (*Keay* 16262).

Habit: tree (*Vigne* 1811); shrub 4–5 m. high or tree 10 m. high (*Chevalier* 521); small tree (*Chipp* 80, *Symington, For. Herb., Ibadan No.* 5662); stem 15 ft. with big, spreading crown (*Harris* 78); small, spreading tree (*Dawe* 806); fairly large tree, bole usually runs straight and branchless for 15–20 ft. (*Turner* 110); large tree (*Aylmer* 33, *Myers* 8377); large spreading tree (*Burnett* 15); tall tree (*Chipp* 25); lofty tree (*Wyld* 49); tree 25 ft. (*Keay* 16262); tree, usually 25–30 ft. but up to 40–50 ft. (*Hoyle* 597); tree 30 ft. high and 3 ft. girth (*Vigne* 3915, 4484); tree 30–40 ft. (*Chandler* 581); tree 40 ft. (*Schweinfurth* 2078, *Chandler* 582); clear trunk to 30 ft. (*Hancock* 752); tree 40 ft. high and 2 ft. girth at breast height (*Keay* 16264); tree 30–50 ft. with spreading flat-topped crown (*Hoyle* 682); taller tree than No. 585 (*L. schimperi*), more erect branching, with straighter trunk and more elegant habit (*Hoyle* 586); tree 60 ft. (*Eggeling* 779).

Habitat: open land (*Dawe* 806); savanna (*Forest Ranger Byasi* 1); savanna forest (*Vigne* 1811, 3915, 4484); savanna open woodland (*Symington, Forest Herb., Ibadan No.* 5662); common throughout Li Yabongo district, Sudan (*Wyld* 49); frequent in khor (*Myers* 8377); frequent, almost invariably associated with no. 585 (*L. schimperi*); in deciduous " ironstone " savanna woodland (*Hoyle* 586); on rocky soil (*Aylmer* 33); in tall-grass woodland over mountainside, common in fire-swept country (*Chipp* 25); on grassy hillside (*Harris* 78); in *Terminalia*—other species woodland or near streams (*Hancock* 752); open savanna woodland with *Uapaca somon*, *Daniellia*, *Butyrospermum* and *Cussonia* (*Keay* 16262); open savanna woodland with *Uapaca somon*, *Isoberlinia doka*, etc. (*Keay* 16264).

Vernacular names:

Northern Nigeria (Hausa): FARU (*Dalziel* 178).
French Sudan: BEMBE (*Chevalier* 521).
Uganda (Madi): AZU (*Forest Ranger Byasi* 1).

L. velutina *A. Rich.*

SENEGAL. *Heudelot* 992 (Herb. Kew !, Herb. Fielding, Oxon. !).

GAMBIA. Bulak, *Rosevear* 37 (Herb. I.F.I., Oxon. !), lvs. only; Albreda, *Leprieur*, type, fr. May.

FRENCH SUDAN. Bamako, *Hagerup* 36 (Herb. Kew !), fls. and young lvs., 26 April, 1927.

PORTUGUESE GUINEA. Without precise locality, *Joachim Viegas* 499 (Herb. Kew ! ex Jard. Col. de Lisboa), frt. and semi-mature lvs., no date.

GOLD COAST. Northern Territories: Tumu, *C. Vigne* 3788 (Herb. I.F.I., Oxon. !), frt., April 1935; Dimshi, *Kitson* 644 (Herb. Kew !), semi-mature lvs. only, 14 April, 1927; Pan to Bujan, *Kitson* 652 (Herb. Kew !), semi-mature leaf only, and 646 (Herb. Kew !), frt. and detached semi-mature lvs., both dated 18 April, 1927; Dubba to Terriwama (or Jerriwama ?), *Kitson* 945 (Herb. Kew !), fls. and young lvs., 16 March, 1927.

Habit, etc.: large tree (*Kitson* 644); tree 20 ft. by 1 ft. girth in savanna forest (*Vigne* 3788).

Vernacular name (Gambia): BEMBO (*Rosevear* 37).

A. Chevalier (Bot. 159) cites the following numbers under *L. velutina.* Since one of them has perhaps the fullest notes of any specimen recorded or available, we quote them here.

FRENCH GUINEA. Kollangui, *Chevalier* 12225 (fls. ?), March 1905; between the Konkouré and Timbo, *Chev.* 12871, 13577 (fls. ?), March, 1905; " route de Longuery," 14830 (*O. Caille*), fls., 1 Dec., 1905.

Obs.—Tree 6 m. high, with yellow flowers (no. 14830).

We are grateful to our colleague, Mr. J. P. M. Brenan, of the Department of Forestry, Oxford University, for the valued expression of his critical opinion at various stages of this investigation.

The subject has been treated much more fully than is (unhappily) customary, because of the amount of confusion which exists, and also because of the undoubted importance of species of *Lannea* in the ecological study of dry-zone vegetation in North and East Tropical Africa.

Since the above was written, and before its publication was possible, a very interesting and instructive paper on " Les *Lannea* de l'Afrique occidentale française," by A. Aubréville (L'Agronomie Tropicale **1,** 3–4, 125–137: 1946), was received through the good offices of Professor Normand of Paris. The treatment of the dry-zone species in this paper is admirable, except where M. Aubréville seems to have been misled by the mixture in the type material of *L. barteri*, which is the chief subject of the present account. If, throughout M. Aubréville's paper, the name *L. kerstingii* is substituted for *L. barteri*, then we are in complete agreement with him, in so far as we have seen the material he cites.

SPECIES OF *LANNEA* DISCUSSED IN THIS PAPER

L. barteri (Oliv.) Engl.—nomen confusum. Fls. = *L. schimperi*; leaves = *L. kerstingii.*

L. discolor (*Sand.*) *Engl.*—A valid species, though very closely related to *L. schimperi* and perhaps only subspecifically distinct.

L. kerstingii *Engl. & Krause.*—A valid species, though closely related to *L. velutina.*

L. rufescens Engl. e descr. = L. schimperi.

L. schimperi (*Hochst. ex A. Rich.*) *Engl.*—A valid species.

L. sessilifoliolata Engl. = L. kerstingii.

L. stolzii Engl. & v. Brehm. =L. schimperi.

L. velutina *A. Rich.*—A valid species.

NEW PLANTS FROM THE NEARER EAST.

M. ZOHARY AND P. H. DAVIS.

1. SONCHUS

A remarkable woody *Sonchus*, apparently endemic to cliffs in the Judean Desert and Moab, appears to have eluded the earlier botanists. The species now described is an exceptionally interesting one, not only ecologically but also in its habit and taxonomy, presumably constituting a link between *Lactuca* and *Sonchus*.

The dividing line between these two genera is a difficult one to draw, the beaked nature of the achene in *Lactuca* having several exceptions in the Near East. G. Ledyard Stebbins, Jr., in " Critical Notes on *Lactuca* and Related Genera " (Journ. Bot. 1937, p. 12), states of *Lactuca* that " the achene is definitely flattened, and has two strong lateral ribs or wings, with a varying number of lesser ribs on each face. Whether beaked or not, moreover, it possesses a strongly expanded pappus disk." The achenes of *Sonchus*, on the other hand, " are flattened or four-sided, as are those of *Lactuca*, but lack the expanded pappus disk."

Despite its unusual habit and shortly attenuated achenes (reminiscent of some *Lactuca*), we have decided to place our plant in *Sonchus* owing to the absence of an expanded disk. It should be noted that *S. pustulatus* Willk. [S. *tenerrimus* L. ssp. *pustulatus* (Willk.) Bat.] and the microspecies *S. dianae* Lacaita are somewhat suffrutescent chasmophytes from N. Africa and Spain. These have truncated achenes of typical *Sonchus* shape, but they possess several vegetative characters (such as the wool in the axils of the leaves) which are found also in our plant. In its woody habit, and even in the form of its leaves, *S. pinnatifidus* Cavanilles, from the rocks of S.W. Morocco and the Canaries, shows some resemblance to the plant here described, and confirms our view that the new species is better placed in *Sonchus* than in *Lactuca*. It must, however, be considered a very isolated type, and, though its nearest affinity may be with the *S. tenerrimus* L. group, it seems advisable for the present not to relate it to any species previously described.

Sonchus suberosus *Zohary et Davis* sp. nov.

Species insignis, saxatilis, suffrutescens. Probabiliter inter *Sonchum* et *Lactucam* species intermedia est.

Planta suffruticosa, a basi lignosa, foetida. *Caulis* lactifer, inaequaliter ramosus, usque 40 cm. altus et 2 cm. crassus, valde suberosus ; suber longitudinaliter fissum. *Rami* hornotini, 30–70 cm. longi, 2–7 mm. crassi, teretes, eburneo-albi, lucentes. *Folia* oblonga, runcinato-pinnatifida, 5–10 cm. longa (inferiora saepe longiora), glabra, 6–12-lobata ; lobi laterales ovato-oblongi vel lanceolati, irregulariter dentati, terminalis latior, ovato-triangularis. *Folia* vernalia alterna, remota, petiolata, petiolo basi dilatato vaginato et semiamplexicauli ; folia autumnalia 5–7 fasciculata in axillis foliorum vernalium lanigeris disposita. *Cymae* paniculatae, ex axillis foliorum vernalium enatae ; interdum inflorescentia ad capitulum unicum reducta. *Pedunculi* ± elongati, superne foliolis remotis minutis lineari-lanceolatis praediti.

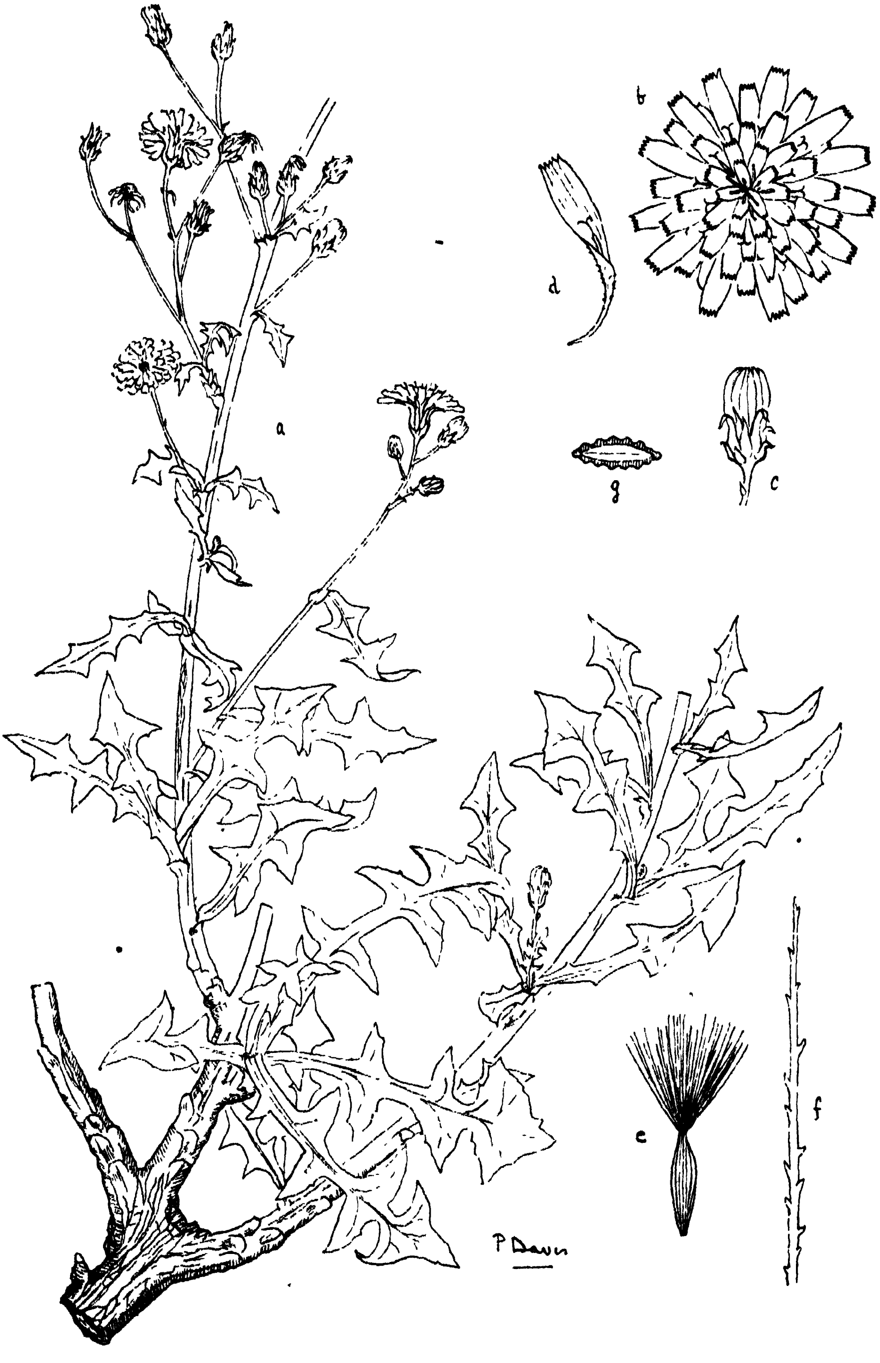

FIG. 1.—*Sonchus suberosus* Zohary et Davis sp. nov. a, general habit of the plant (× 3/10) ; b, c, capitulum (nat. size) ; d, floret (× 2) ; e, achene (× 3½) ; f, single hair of pappus (much enlarged) ; g, cross section of achene (× 12).

Capitula multiflora, 2–3 cm. diametro. *Flosculi* lutei, inferne hirsuti. *Involucrum* ±campanulatum, ca. 10 mm. longum et 5–6 mm. basi latum ; phylla exteriora ad quadrantem vel ad duas partes longitudinis phyllorum interiorum, interiora superne minute ciliata, obtusa, apice recurva. *Receptaculum* nudum. *Achaenia* glabra, conformia, elliptica, ± compressa, 4 mm. longa, vix 1 mm. lata, fusca, ca. 12-striata, 3–4 -costata, transverse vix rugosa, apice breviter attenuata, erostrata, disco haud expanso. *Pappus* albus, deciduus, achaenio aequilongus vel parum longior ; setae conformes, tenues, flexuosae, sub lente setoso-denticulatae. Floret Oct.-Febr.

PALESTINE. Judean Desert : Wadi Qelt cliffs, 1931, 1932, *Eig* ; ibidem, 1941, *Daniel Zohary* ; Wadi Haritun, S.E. of Bethlehem, 1942, *Davis et Kushnir* (type) ; Jebel Qarantal cliffs, 1942, *Davis*.

TRANSJORDAN. Moab : Wadi Zerka Maïn, 1945, *Davis* ; Wadi Heidan cliffs, 1945, *Davis*.

Type in Herb. Hebr. Univers., Jerusalem. Co-types in Herb. Kew.

Sonchus suberosus is woody at the base (more so than *S. pustulatus* Willk.) the wood being covered by an elastic corky substance. In the early spring new stems, bearing alternate leaves only, grow up from the base, but at the approach of summer these shed their leaves and the plant looks dead throughout the dry season. In the early autumn clusters of leaves and inflorescences develop in the axils of the dead foliage. The large flowers continue to bloom throughout the winter. After seeding, these branches die back towards the base and only their lower parts become woody, from which arise new branches the following season.

The plant occurs chiefly in the Irano-Turanian territory of the Judean Desert and Moab, where it is confined to cliffs, generally of hard Cenomanean limestone and preferably in complete shade ; it ranges from sea-level to about 650 m.

In Wadi Haritun (Judea) *Sonchus suberosus* is locally co-dominant in small vertical cracks and holes with *Podonosma syriaca* and *Centaurea eryngioides* ; while in Wadi Qelt it is found only in the narrowest parts of the chasm, where it grows with *Podonosma* and *Capparis aegyptiaca*. On the even drier rocks of Jebel Qarantal it is found in the same association, but is not as luxuriant as on the cooler rocks of Wadi Haritun. It is particularly abundant in Wadi Zerka Maïn (Moab), especially in association with *Podonosma* on the hard limestone, but also occurs there on local intrusions of Quaternary basalt with *Euphorbia thamnoides*.

Our plant may be considered a " rigid " Tertiary relict.

2. FERULA

The genus *Ferula* is one of those plant groups abundantly represented both in the Mediterranean and the Irano-Turanian countries of the Nearer East. There is, however, no doubt that the Irano-Turanian region constitutes the main and primary centre of this genus, and that the Mediterranean species are to be referred both genetically and historically to Irano-Turanian stock. Similar phytogeographical relations have been found for a series of Mediterrano—Irano-Turanian genera or subgeneric groups such as *Dianthus*, *Phlomis*, *Verbascum*, and

Asphodeline. This opinion is based, among other points, on the fact that the genera in question have produced many species in the Irano-Turanian Region and fewer in the Mediterranean Region.

In *Ferula* we find seven very restricted endemic species in the Syrian Desert and only two in the adjacent Mediterranean territory of Syria and Palestine. The same proportion of endemics is to be found in Turkey.

The section *Peucedanoides* Boiss. of the genus *Ferula* is the section most richly represented in our district, and the following two species from Palestine and Turkey also belong to this group.

Ferula (Sect. **Peucedanoides**) **amani** *Zohary et Davis* sp. nov.

A *F. cassii* Zohary et Davis[*] foliis minus decompositis, foliorum laciniis crassioribus magis divergentibus, vaginis oblongo-lanceolatis (non late ovatis), pedunculo umbellae centralis longiore differt. A *F. anatolica* Boiss. foliis dense hispidulis, dentibus calycinis obsoletis, vaginae forma divergit. A *F. cachroide* (Schlecht.) Zohary et Davis[†] laciniis divergentibus brevioribus latioribus dense hispidulis, umbellis centralibus pedunculatis inter alia recedit. A *F. orientali* L. (planta Tournefortii ad Erzerum collecta) laciniis brevioribus, vaginis oblongo-lanceolatis, stylis brevioribus discrepat. A *F. samariae* Zohary et Davis caulibus glaucescentibus, vaginis oblongo-lanceolatis, laciniis brevioribus dense hispidulis praeter alia signa distinguitur.

Perennis. *Caules* 1.5–2 m. alti, laeves, striati, superne glaucescentes, subverticillatim ramosi ; rami tenues, usque ad 20 cm. longi. *Folia* basalia 40 cm. longa, ambitu late ovata, griseo-viridia, longe petiolata ; petiolus superne incrassatus ; foliorum divisiones primariae oblongae petiolulis 5 cm. longis praeditae ; divisiones secundariae oblongo-ovatae ; tertiariae ovatae ; laciniae oblongo-lineares, acutae, margine revolutae, valde divergentes, griseo-virides, 1.5–2.5 mm. longae, 0.5 mm. latae, e toto cum parte rhachidis superiore dense hispidulae ; folia caulina vaginis turgidis coriaceis oblongo-lanceolatis striatis glaucescentibus 8–15 cm. longis, 2.5–4 cm. latis ; foliorum superiorum laciniae longiores et laxiores quam laciniae foliorum basalium. *Bracteae* plerumque binae, subulatae, 3–8 mm. longae, 1–1.5 mm. latae. *Involucelli* phylla triangulari-subulata, usque 2 mm. longa. *Umbella* centralis fertilis, 10–20-radiata, 8–10 cm. lata, pedunculis 5–12 mm. (rarius 40 mm.) longis, 2 mm. crassis, radiis 3–4 cm. longis ; umbellae steriles 2–4, longe pedunculatae. *Flores* ignoti ; calyx obsoletus. *Diachaenium* pedicello suo aequale, ellipticum, atrofuscum, glaucescens, 9–10 mm. longum, 3.5–5 mm. latum, apicem versus parum inflatum ; styli stylopodio conico depresso 2.5–3-plo longiores ; juga interiora crassiuscula, approximata, exteriora in marginem crassum abeuntia ; alae ca. 1 mm. latae ; vittae latae valleculas implentes, commissurales binae.

TURKEY. Amanus Mts. : above Karaksieh, 500–800 m. in a Pinetum Brutiae ; Achagi Zarkoun, about 1,800 m. in a Pinetum Brutiae and P.

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[*] **Ferula cassii** *Zohary et Davis*, nom. nov. *F. meifolia* (Fenzl) Boiss. Fl. Or. **2**, 984 (1872)—nec Eckl. et Zeyh. Enum. 348 (1835).

[†] **Ferula cachroides** (*Schlecht.*) *Zohary et Davis*, comb. nov. *Polycyrtus cachroides* Schlecht. in Linnaea, **17**, 126 (1843). *Ferula schlechtendalii* Boiss. Fl. Or. **2**, 985 (1872). (Haud *F. cachroides* Fisch. in Hort. Gorenk. ed. 2, 46 (1812), nom. nud. = *F. caspica* Bieb.)

Laricio (type); eastern slopes of ascent to Achagi Zarkoun, 1,000–1,500 m., all 1932, *Eig and Zohary*. Type in Herb. Hebr. Univers., Jerusalem. Co-type in Herb. Kew.

F. amani is both morphologically and geographically closely related to *F. cassii* Zohary et Davis from Mt. Cassius (Syria). In Pal. Journ. of Bot. 2: 170 (1941) some sheets of *F. amani* were erroneously referred to *F. meifolia* Fenzl (i.e. *F. cassii*).

Ferula (Sect. **Peucedanoides**) **samariae** *Zohary et Davis* sp. nov.

Affinis *F. anatolicae* Boiss., laciniis flaccidis divaricatis haud falcatis, vaginis stramineis (non glaucis), dentibus calycinis brevibus et triangularibus recedit. A *F. cachroide* (Schlecht.) Zohary et Davis laciniis longioribus divaricatis, involucellis persistentibus, vaginis minus inflatis divergit. A *F. orientali* L. (specimine Tournefortii) laciniis multo longioribus sparsim scabridulis, vaginis ovato-oblongis (non ample ovatis, haud cucullatis), stylis longioribus discrepat.

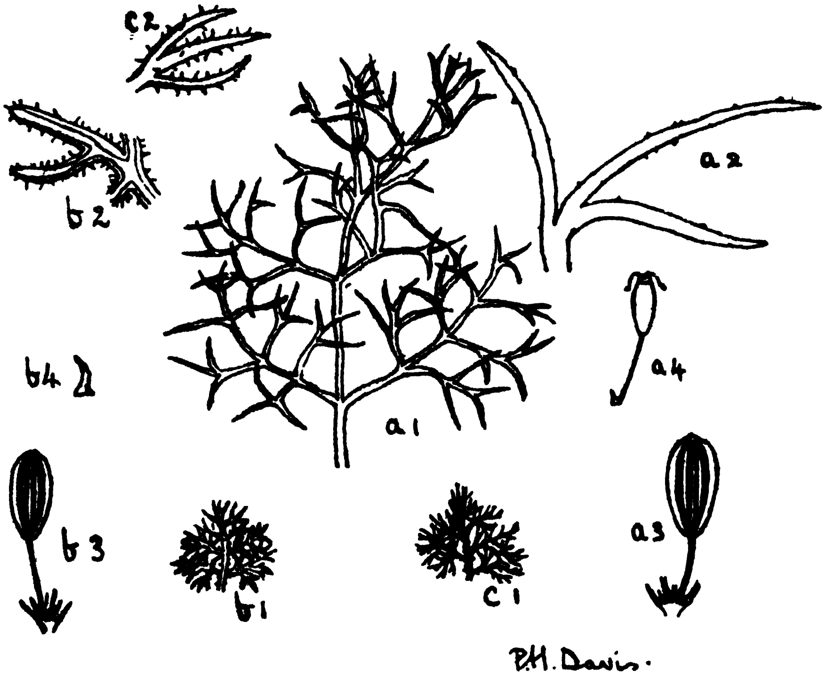

FIG. 2—a_1–a_4 *Ferula samariae* Zohary et Davis, sp. nov. a_1, leaf (× 1) ; a_2, laciniae of leaf (×4) ; a_3, diachenium (× 1) ; a_4, young fruit showing stylopodium and styles (× 1).
b_1–b_4 *Ferula amani* Zohary et Davis, sp. nov. b_1, leaf (× 1) ; b_2, laciniae of leaf (×6); b_3, diachenium (× 1); b_4, involucel bract (×5).
c_1–c_2 *Ferula cassii* Zohary et Davis. c_1, leaf (× 1) ; c_2, laciniae of leaf (×4).

Perennis. *Caules* 1–4-enati, 1–1.5 m. alti, laeves, striati, virides, superne subverticillatim ramosi. *Rami* usque 18 cm. longi, 2–3 mm. crassi. *Folia* basalia flaccida, ambitu late ovata, viridia, post anthesim evanida, 80 cm. longa ; petiolus glaber, striatus, inferne incrassatus, in vaginam lanceolatam abiens ; divisiones primariae ternatae, obovatae, petiolulis usque ad 10 cm. longis ; divisiones secundariae obovatae,

petiolulis ad 8 cm. longis ; laciniae lineares, flaccidae, planae, parce scabrae, angulo acuto divergentes, plerumque 5–10 mm. longae, 0.3–0.5 mm. latae, acutae ; folia caulina vaginis ovato-oblongis turgidis membranaceis pallide stramineis striatis transverse venosis amplexicaulibus, 9–12 cm. longis, 5 cm. latis suffulta ; laciniis laxis, plerumque 1–3 cm. longis, 1 mm. maxime latis. *Bracteae* binae, oppositae, filiformes, acutae, 0.8—1.5 cm. longae, 0.5–1.0 mm. latae, deciduae. Involucri phylla obsoleta, decidua. Involucelli phylla triangularia vel triangulari-subulata, 1 mm. longa vel longiora. *Umbellae* 10–30-radiatae, 5–8 cm. diametro ; pedunculus centralis 2–4 cm. longus, 2–3 mm. latus ; radii plerumque 2–3 cm. longi, 1 mm. crassi ; umbellae externae steriles, 5–6 cm. longae. Flores lutei. Calycis dentes brevissimi triangulares petalis quadruplo breviores. *Fructus* pedicellis 5–10 cm. longis praediti, elliptici, pallide fusci (non glauci), ca. 11 mm. longi, 5–6 mm. lati, apicem versus parce inflati. Styli stylopodio depresso conico 2–2.5-plo longiores ; juga interiora tria, crassiuscula, approximata, exteriora in marginem crassam abeuntia ; alae 1 mm. latae vel paulo ultro ; vittae valleculas implentes ; commissurales binae. Floret Mart.-April.

PALESTINE. Hard limestone cliffs in Wadi Beidan near Nablus, 400 m., 1942, *P. H. Davis* 4580 (type); 4860. Type in Herb. Hebr. Univers., Jerusalem ; co-type in Herb. Kew.

This rare and handsome species is very distinct from any other Palestinian *Ferula*, and even resembles certain Anatolian species more closely than the only Syrian plant in this group—*F. hermonis* Boiss. The feathery, flaccid, pale-green leaves give the plant a superficial resemblance to *F. communis*, but the fruits place it at once in the *Peucedanoides* section. *F. samariae*, is, in fact, very isolated geographically, and is one of the rarest endemics in Palestine.

The new Ferulas belong to a group of species consisting of *F. anatolica* Boiss., *F. cachroides* Zohary & Davis, *F. cassii* Zohary & Davis and *F. orientalis* L., which are mostly inadequately described and without ripe fruits. Although these plants appear to be very close to one another it seems that Boissier was right in considering them as separate species each confined to a special geographical area.

On the other hand, Boissier in his Flora Orientalis appears to have merged several different Ferulas into one species—*F. orientalis*. This species was originally inadequately described and illustrated by Tournefort from material collected by him at Erzerum. Boissier described it anew in 1844 as *Peucedanum orientale* Boiss., and added several details not mentioned in Tournefort's original description. In his Diagnoses Plantarum Orientalium Novarum (1854–59) Boissier described another new *Peucedanum*—*P. rupestre*, collected in Cappadocia and formerly published as *F. rupestris* in Plantae Anatoliae Exsiccatae by Boissier and Balansa. He apparently considered this plant sufficiently distinct from *P. orientale*, etc., to make it a new species. Later, in Flora Orientalis, he united these two plants and also other slightly differing specimens from the Crimea and Caucasus under the name of *Ferula orientalis* L. In this way Boissier amplified the original description of Tournefort's plant from Erzerum to include the other specimens mentioned ; but, in spite of the mixed character of the description, Boissier, when referring to allied species in Flora Orientalis apparently took *F. orientalis* sensu lato as a basis for comparison. Boissier's *F. orientalis* as understood by us is a collective species.

As regards other Ferulas of the *F. orientalis* group, we have examined specimens of *F. cassii* collected by Post from the *locus classicus*— Mt. Cassius—which fully agree with Boissier's description of that plant. We have also seen material from the environs of Belled el Sheikh near Antioch which we must tentatively retain as *F. orientalis* L. until this species has been revised. In Post's herbarium there is a plant named *F. meifolia* Fenzl (i.e. *F. cassii*) collected by him from " Karakillissa—Genskum " which may constitute another species near to *F. amani*; but the material is insufficient for description. Incomplete specimens determined by Freyn as *F. schlechtendalii* Boiss (i.e. *F. cachroides*) from Turkish Armenia (Kyl-Maghara-Dagh and Kota) by no means resemble the type in the Kew Herbarium.

F. amani, like *F. cassii*, is obviously a true Mediterranean species; *F. samariae*, however, grows on the Irano-Turanian edge of Palestine's Mediterranean zone. The slopes below the cliffs now support a decidedly Irano-Turanian vegetation, but a few remnants of *Quercus calliprinos* indicate a Mediterranean vegetation at a fairly recent date, and relict plants of such woodlanders as *Lonicera etrusca* and *Smilax aspera* on shadier parts of the cliff confirm this view.

3. THYMUS

Thymus syriacus *Boiss.* subsp. **eigii** *Zohary et Davis* subsp. nov.

A *T. syriaco* ipso haec subspecies habitu robustiore minus glanduloso, foliis floralibus inferioribus majoribus late ovatis breviter acuminatis quam floribus longioribus, calycis dentibus tenuioribus inter alia divergit.

Caules lignosi, usque ad 2 cm. crassi. *Rami* floriferi inferni saepe horizontales, superni erecti, plerumque 15–20 cm. longi, 1–2 cm. crassi, quadrangulares, goniotrichii. *Folia caulina* lanceolata vel lineari-lanceolata, acuta, 2 cm. longa (vel paulo ultro), 2–6 mm. lata (nunc latiora), subsessilia, integra vel remote denticulata, rigida, plana vel plicata, glabra, margine scabriuscula, glanduloso-punctata, parte inferiore 7–9-nervosa et sparsim longe ciliata. *Inflorescentia* capitata, late ovata, ca. 2 cm. longa et lata. *Folia floralia* late ovata, breviter acuminata, interdum purpurea, inferiora 15 mm. longa, 7–10 mm. lata, floribus

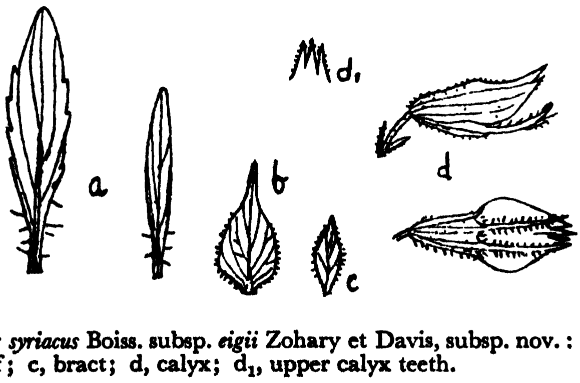

FIG. 3.—*Thymus syriacus* Boiss. subsp. *eigii* Zohary et Davis, subsp. nov.: a, stem leaves; b, floral leaf; c, bract; d, calyx; d_1, upper calyx teeth.

longiora, 9–12-nervosa, ciliata. *Flores* breviter pedicellati ; pedicelli 2–4 mm. longi. *Calyx* 6–7 mm. longus, saepe purpureus, pubescens, minutissime glandulosus, infra medium bifidus ; labium superius late ovatum, minute ciliatum, 3-dentatum ; dentes triangulari-lanceolati ; dens medius longior, labio plus quadruplo brevior ; labium inferius superiori aequilongum vel brevius, usque ad basin fissum ; dentes subulati, ciliati. *Corolla* exserta, usque ad 10 mm. longa, rosea, glanduloso-pubescens ; labia aequilonga, superius ovatum, emarginatum, inferius 3-lobatum ; tubus obconicus, calyci fere aequilongus. *Stamina* longe exserta, filamentis purpureis sparsim hirsutis.

TURKEY. Amanus Mts : Prope Beilan, in adscensu ad vineta versus fontem Tschaush Kara, alt. 900 m., 1862, *Kotschy* ; above Karaksieh, 500–800 m., in Pinetum Brutiae, 1932, *Eig and Zohary* (type).

SYRIA. Between Belled el Sheikh and el Ourdou (S. of Antioch), on Cenomanian rocks in a *Quercetum infectoriae* and *Q. calliprini*, 1932, *Eig and Zohary*.

Type in Herb. Hebr. Univers., Jerusalem ; co-type in Herb. Kew.

T. syriacus subsp. *eigii* is superficially so distinct from *T. syriacus* as represented by material from the Baalbek district that at first we did not recognise it even as allied to that species. But it was considered as *T. syriacus* by Boissier ; in his Flora Orientalis he refers to Kotschy's specimens of *T. syriacus* from Amanus (which we have seen in the Kew Herbarium), remarking " forma bracteis majoribus, calycis dentibus longioribus." We have had the opportunity of examining a large series of specimens of *T. syriacus* from the environs of the Syrian Desert, and realise that this species is a very polymorphic one in every respect. Intermediate forms between typical *T. syriacus* and the subspecies described above are not rare. Nevertheless, the specimens from Amanus and Northern Syria are so distinct from typical *T. syriacus* that we consider them to deserve at least subspecific rank. The two plants are also separated ecologically ; the type is an Irano-Turanian element, whereas the subspecies is centred in the Mediterranean zone.

WILLIAM JACKSON BEAN, C.V.O., I.S.O., V.M.H.—The death of William Jackson Bean, formerly Curator of the Royal Botanic Gardens, Kew, occurred on April 19, 1947, within a few weeks of his eighty-fourth birthday.

Bean started life with few worldly advantages, and worked during his early years the arduous life of a garden apprentice, but he acquired very considerable eminence in his profession and the nation-wide respect and esteem of horticulturists. He had one initial advantage, for he was born and bred to horticulture, as were the three previous generations of his family. However, his father died when Bean was very young, and his training could not be guided from home. Born on May 26, 1863, in a village near Malton, at the foot of the Yorkshire Wolds, he was educated at Holgate School, York, leaving school at the age of sixteen to acquire training in the famous gardens at Belvoir Castle. At the age of twenty he entered the Royal Botanic Gardens, Kew, as a student gardener, with no fixed ideas for the future. George Nicholson, at that time Curator of the Gardens, who was ever ready to help aspiring young men, was impressed with the ability and earnestness of young Bean, and it was not long before he selected him for promotion. He served successively as sub-foreman of the Palm House and Orchid Houses, where he came under the notice of that strict disciplinarian, Thiselton-Dyer, then Director of the Gardens. When a vacancy occurred, Bean was appointed foreman of the Temperate House, and after occupying that position for five years he was transferred to the Arboretum as foreman in 1892. Some eight years later he was advanced to the post of Assistant Curator for the Arboretum and in 1900 he was appointed Assistant Curator of the Gardens. His promotion to Curator dated from 1922, and he relinquished the post on attaining the age limit in 1929.

Bean had the pen of a ready writer, and during his early days at Kew he was a regular correspondent of *The Garden* and *The Gardeners' Chronicle* when those journals were presided over by William Robinson and Dr. Maxwell T. Masters respectively. In 1890, he collaborated with the late William Watson in the authorship of a book on " Orchids, their Culture and Management ". About the time when he himself retired from Kew, Thiselton-Dyer recommended Bean for the preparation of a book descriptive of the Royal Botanic Gardens and the work of the establishment, which was published in 1908. At this time and during the following years Bean contributed numerous articles to the *Kew Bulletin of Miscellaneous Information*, and described a number of species of trees and shrubs in the Botanical Magazine. In 1908 he began his great work, " *Trees and Shrubs Hardy in the British Isles*," the first two volumes of which were published in 1914. Owing to the pressure of official duties the third volume could not be prepared until after his retirement, and it was published in 1933. For the last few years he has been engaged upon a new edition of " Trees and Shrubs " and on descriptive work on trees and shrubs for the new " *Dictionary of Gardening* " in course of preparation by the Royal Horticultural Society.

Mr. Bean undertook a number of official visits to various European countries on behalf of the Government. He also visited the Arnold Arboretum and other important establishments in the United States.

Had it not been for the outbreak of war in 1914 Bean would have gone to South Africa to advise about certain features in the lay-out of the Kirstenbosch Gardens. During the early part of the 1914–18 war he was seconded to the Ministry of Agriculture for a short period, but the work did not appeal to him. For several years he was a member of the committee appointed by King George V to advise on the trees in Windsor Great Park ; he was also a member of the Floral Committee of the Royal Horticultural Society, and had a seat on the Technical Committee of the Roads Beautifying Association. After his retirement he acted for a year or two in an advisory capacity to the latter body.

Bean was the recipient of many honours. For his work at Windsor he was made Commander of the Royal Victorian Order, and for his work at Kew he was awarded the Companionship of the Imperial Service Order. In 1918 the Royal Horticultural Society awarded him the Victoria Medal of Honour and later he was made an honorary Fellow of the Society. In 1923 the same body awarded him the Veitch Memorial Medal. When Mr. Ernest Moore, the artist, was preparing for his exhibition of portraits of famous Yorkshiremen, Mr. Bean was asked to sit as one of the number. The portrait was afterwards purchased by Mr. Reginald Loder and presented to Kew, where it hangs in the Gardeners' Library. Bean's earliest recreation was cricket ; later he took up both tennis and golf.

I was very closely associated with Bean for many years, first as his propagator and sub-foreman in the Arboretum, later as foreman of the Arboretum. Later still we had adjoining offices, after I was transferred to the Museums, and I could not wish for a better colleague. He had been a widower for many years, and leaves one son and one daughter to whom our sympathy is extended.

W. D.

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CLASSIFICATION OF THE BANANAS.

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I. The Genus Ensete Horan.

A plant of Abyssinia, described and figured by the traveller Bruce under its native name *Ensete*, was referred to the Linnean genus *Musa* by Gmelin in the 13th edition of Systema Naturae (1791). Gmelin used the word " Ensete " as the specific name, and his very brief diagnosis runs as follows :

> Ensete. 3. M. spadice nutante, bracteis terminalibus.
>
> *Bruce trav. in Eg. Ar. Ab. and Nub.* 5. *app.p.* 36 icc.

In 1862 Horaninow (*Prodromus Monographiae Scitaminearum*) considered that the plant in question was sufficiently distinct to represent a new genus, and accordingly raised the name Ensete to generic rank, renaming the species *Ensete edule*. The following is (with the exception of a footnote in which he discusses the term " spadix ") a full transcription of Horaninow's descriptions, both generic and specific*; it should be noted that he erroneously attributes both the generic name and the binomial to Bruce, who in fact used " Ensete " merely as a vernacular name :

> II. **ENSETE** Bruce Reise an die Quellen d. Nils V. p.47. t. 8–9 Musa Ensete Gmel. Syst. nat. 2. 567.
>
> Flores abortu polygami, permulti. Hermaphrod. inferis hypanthium Musae triloculare multi-ovulatum. Perigonii labium majus lineare elongatum, apice trifidum, basi labellum breve ovatum emarginatum et longe-mucronatum amplectens. Stamina 5 labio majori sublongiora, sexto (parastemone ?) breviori, antheris linearibus, filamento aequilongis : stylus brevior, stigmate trilobo. Flores masc. superiores similes, hypanthio et stylo abortivis. Bacca oblongo-pyriformis, coronata, abortu 1–3–4-sperma : semina nucamentacea magna angulosa fusca, testa crassa, ad umbilicum excavata, albumine subfarinoso : embryo . . .
>
> *Ensete edule* Bruce l.c. Musa Ensete Gmel. l.c. Hook. in Kew Gard. misc. 8, 210. Enseté Poir. in Dict. sc. nat. v. 14. p. 515. Bot. Mag. t. 5223–24. Op. nostri t. 4. Revue hortic. 1861. p. 124. Fl. d. serres

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* I am much indebted to Dr. T. A. Sprague for obtaining and checking transcriptions, and for investigating on my behalf the validity of *Ensete* as a generic name.

XIV. p. 65. t. 1418.—Planta maxima 40-pedalis, in humidis Abyssiniae occidentalis vigens, perennis, Musam superbam et glaucam aemulans, caudice endogaeo discoideo non stolonifero, caulomate crasso conico, phyllopodiis maximis crassis lacunosis subimbricatis obvallato, foliis 2–3- orgyalibus brevi-petiolatis lanceolatis utrinque acutis firmis, costa valida dorso fusco-purpurea : thyrsus (spadix) nutans brevistipitatus, bracteis (spathis) confertissimis pedalibus ovatis acutis fusco-virentibus, floribus ebracteolatis 4-pollicar. albis : bacca molli fatua flavescente 2–3-poll., semina magnit. n. avellanae. Medulla scapi saporis triticini, decocta c. lacte et butyro, vescam incolis praebet.

Vidi vivam plantam in horto Kew. 1859 cultam et semina sicca exploravi, at characterem generis, a Musa floribus inferis hermaphrod., petalorum gemellorum defectu ? staminodio magis exculto, fructu coronato et semine partim distincti, ad icon. et descriptiones cl. Bruce et Bot. Mag. exposui, observationibus novis rectificandum.

Since 1862 the genus *Musa* L. has been surveyed by Sagot (1887), J. G. Baker (1893), K. Schumann (1900), and De Wildeman (1912), and other botanists have written on it, but nobody has seen fit to maintain Horaninow's genus. Baker's arrangement of *Musa*, followed in its main features by Schumann in Engler's *Pflanzenreich*, remains the standard treatment of that genus down to the present day, and according to it *M. ensete* Gmel. and a number of other species form a subgenus *Physocaulis* Baker.

Genetical, cytological, and taxonomic studies of *Musa* in connexion with a banana breeding programme have convinced me of the desirability and propriety of reviving *Ensete* Horan. and transferring to it about twenty-five species hitherto included in *Musa* L. These comprise the whole of Baker's subgenus *Physocaulis*, two species that he classified in *Eumusa*, and a number that have been described since 1893 and referred to *Musa* § *Physocaulis* by their authors.

The desirability arises from the fact that *Musa* as hitherto recognized is an unwieldy genus, which becomes more compact and easy to study (though still difficult enough) when this group of species is removed from it. At the same time, the study of *Ensete* itself should be greatly facilitated by its segregation. It is an interesting genus in its own right, but has been neglected on account of the formidable implications of its association with *Musa*.

The propriety is to be judged from the number of respects in which the group differs from other sections of *Musa*. *Ensete* as I propose it is a genus of single-stemmed monocarpic herbs, with pseudostems dilated at the base ; *Musa sensu strictiore* is a genus of stooling perennial herbs with cylindrical pseudostems. The fruit of *Ensete* contains a relatively small number of large seeds, rarely less than 1 cm. in diameter, irregularly globose and smooth : that of *Musa* contains a larger number of small seeds, rarely attaining 1 cm. in diameter, very various in shape, often irregularly and sharply angular, rarely either globose or smooth, and if both, then very much smaller than those of any *Ensete* sp. and readily distinguishable. Both genera have wide ranges and they overlap, but *Ensete* has its greatest development in Africa, and many of its species grow in grassy or rocky places at altitudes where the climate is cool, whilst *Musa sensu strictiore* has no indigenous species in Africa, and its commonest habitat is in rain-forest country. Finally, the genera appear to differ in chromosome number. The number of species so far examined cytologically in *Ensete* is only 7, but all of them have n=9, whereas a much larger number of species examined in *Musa* have either n=10 or n=11.

The cytological evidence is not advanced as the main reason for segregation of the genus *Ensete*, but it strongly supports the conclusion reached from other considerations. As it is partly scattered and partly unpublished it may for convenience be summarized here. The somatic chromosome number 2n=18 has been found in the following :

(1) Material obtained at Kew and said to be *Musa ensete*, though critical determination was not possible. Count by L. N. H. Larter in Cheesman and Larter, " Chromosome numbers in the Musaceæ ", *J. Genet.* 30 : p. 46 and fig. 17 (1935).

(2) *Musa superba* Roxb. Count by Agharkar and Bhaduri, " Variation of chromosome numbers in Musaceae ", *Curr. Sci.* 3 : 615–17 (1935).

(3) Seedlings from seeds received at I.C.T.A. in December 1936 as *Musa davyae* Stapf. A covering letter from Kew stated that the seeds had been received from the Principal Botanist, Pretoria, and " the plant would seem to be a riverside species which has been recorded from the Spelonken and Zoutpansberg areas of the Transvaal ". Count by K. S. Dodds in 1937, hitherto unpublished.

(4) Seedlings from seeds received at I.C.T.A. in June 1939 from Kew, collected by Dr. G. Herklots near Chintembwe, Nyasaland, at about 5,000 ft. From the locality, and from the size and shape of the seeds, the species was probably *Musa buchanani* Baker. Count by K. S. Dodds, hitherto unpublished.

(5) Seedlings from seeds collected by Dr. Herklots in 1939 in Nyasaland at 4,000 ft. Native name " Chisusu ". These seeds were found to match those of *Musa livingstoniana* Kirk in the Kew Herbarium. Count by Dodds, hitherto unpublished.

(6) Seedlings from seeds collected in Northern Nigeria by B. D. Burtt. The seeds were indistinguishable from those of *Musa gilletii* De Wildem., described from the Congo, and may have been of that species or of another closely related. Count by Dodds, hitherto unpublished.

(7) Seedlings from seeds collected in 1936 by G. B. Masefield at Kalinizo, Masaka District, Uganda. The species was not identified. Count by Dodds, hitherto unpublished.

The full data have been given, because in most cases the plants were not grown on to flowering and critically identified. The important fact is that the plants examined were certainly distinct, and not members of a single species under different names. This fact justifies the assumption that 9 pairs of chromosomes (a number not found in *Musa sensu strictiore*) are likely to be found in other species of *Ensete* when more are studied.

The apparent adaptation of many *Ensete* species to cooler and drier environments than those appropriate to most *Musa* species makes it very difficult, and in most cases impossible, to grow them much beyond the seedling stage in Trinidad ; and consequently we have been prevented from studying them as living plants. For this reason, and because my main concern with the group is to remove it from *Musa*, I am reluctant to attempt any formal emendation of Horaninow's diagnosis. It is clear that several of his characters need modification to cover the whole range of species now transferred to *Ensete*. As one example, the hermaphrodite lower flowers of *E. edule* may not be general. Several species have been described from fruiting specimens, and it is impossible to learn from the literature whether the fruit-forming basal flowers were hermaphrodite or female. In any case, this is not a diagnostic character for *Ensete*, as hermaphrodite flowers occur in several species of *Musa*, section *Eumusa*. A character certainly needing emendation is " bacca . . . . 1–3–4-sperma". But an accurate generic description can only be prepared when the genus has been properly studied, preferably on a living collection in some suitable district of Africa.

Informally the following general outline covers my conception of the genus *Ensete* as it should be emended :

Single-stemmed monocarpic herbs, usually large. True stem remaining short until flowering. Leaves large, the blades oblong, commonly narrowed below into a short or rather long free petiole, the latter again expanded below into a sheathing, but often not completely stem-encircling base. Sheaths of the lower leaves sometimes short, so that the plant has a rosette habit, sometimes long and forming a pseudostem like that of *Musa*. Pseudostem, when formed, nearly always dilated at the base. Upper leaves passing gradually or suddenly into bracts. Inflorescence pendulous. Bracts usually persistent. Flowers many to each bract, in two rows, those of the lower bracts hermaphrodite or female, those of the upper bracts male. Free tepal often tricuspidate, sometimes entire. Fruit leathery, dry or with very scanty pulp, containing relatively few seeds. Seed usually large (i.e. exceeding 1 cm. in diameter), globose or irregular, most commonly smooth, with a conspicuous, irregular and usually deeply sunken hilum.

Basic chromosome number, n=9.

Distribution : Mainly African, but extending to India, Burma, Southern China, Siam, Philippine Islands, Java and New Guinea.)

With the reservation that field study may show some of them to be synonymous, the species clearly belonging to *Ensete*, arranged approximately in the order of their publication, are :

1. **Ensete edule** *Horan*. Prodr. Scitam. 41 (1862) ; *Musa ensete* J. F. Gmelin, Syst. Nat. ed. 13, vol. **2** (1791) 567 ; Baker in Ann. Bot. **7** : 205 (1893).

Note :—It seems very probable that the combination *M. ensete* has been applied to more than one species of the group in cultivation as ornamental plants. I have, therefore, not listed the numerous references which can be found in De Wildeman (1912), *Index Londinensis* and elsewhere ; each of them will need checking by the monographer of the genus.

2. **Ensete superbum** (*Roxb.*) comb. nov. ; *Musa superba* Roxburgh, Hort. Beng. 19 (1814), *nomen* ; Fl. Ind. vol. **2** (1824), 489, *descr.* ; *ibid.* ed. 2, vol. **1** (1832), 667 ; Baker *loc. cit.* 207.

3. **Ensete glaucum** (*Roxb.*) comb. nov. ; *Musa glauca* Roxburgh, Hort. Beng. 19 (1814), *nomen* ; Corom. Pl. t. 300 (1819) ; Fl. Ind. vol. **2** (1824), 490, *descr.* ; *ibid.* ed. 2 vol. **1** (1832), 669.

Notes : Baker placed *M. glauca* Roxb. in his subgenus *Eumusa* because it is described as having a cylindrical stem, but in all its more important characters it agrees with the other Physocaulis species, and Baker himself admits that it " has flowers like *M. superba* ". Sagot (1887), who was the real author of the grouping formalized by Baker, placed it in its right group, but subsequent authors have followed Baker uncritically.

This species specially deserves study, because it has been recorded over a wider range than any of the others, viz. from Burma to the Philippine Islands and Java. Possibly several related forms have been confused.

The plant in the Philippines is depicted in *Philippine Agricultural Review* 6 (1913) facing p. 413 as " Virgen " banana, an unidentified wild species. Teodoro (1915) identifies it with *M. glauca* Roxb. and gives the synonym *Musa troglodytarum doliiformis* Blanco, with a translation of Blanco's description from *Flora de Filipinas* (1877). Quisumbing (1919) has a note that the sap is coloured. The plant in Java is well described by Backer (1924).

Musa nepalensis Wallich, in Roxb. Fl. Ind. vol. **2** (1824), 492, provides a nice problem. Wallich described in great detail a plant from Nepal, of which he says : " I am doubtful if this plant ought to be considered as distinct from M. superba, or as an intermediate species between that and M. glauca, differing from the former in the sheathing petioles, and from the latter in its stature and inflorescence. I shall better be able to determine its character when the plants of it, which I brought down with me, and which thrive very well in the Hon. Comp. botanic garden, shall begin to blossom ". Baker says of it : " Described principally from two large unpublished drawings of Wallich, now at Kew. Not known in cultivation ". Kew Bulletin (1894, p. 243) adds an extract from a letter by Dr. King, dated Calcutta, 22nd August 1893 : " I do not believe in the existence of the species which Wallich called *M. nepalensis.* I have never been able to hear of, or find, any specimens of a big non-stoloniferous plantain on the lower slopes of the Himalaya. I have made enquiries in Nepal where Wallich says it grows. Wallich must have described Roxburgh's *M. glauca* under the name *nepalensis* ". If *M. nepalensis* does exist, it belongs to *Ensete* ; but it does not seem immediately desirable to cumber the literature with a new combination to name so doubtful an entity.

4. **Ensete ventricosum** (*Welw.*) comb. nov. ; *Musa ventricosa* Welwitsch, Apont. 545 and 587, No. 45 (1859) ; Baker *loc. cit.* 206.

5. **Ensete livingstonianum** (*Kirk*) comb. nov. ; *Musa livingstoniana* Kirk, in Journ. Linn. Soc. **9** (1867), 128 ; Baker *loc. cit.* 207.

Note : The seeds of this species are described as " tubercled "; but I have examined what appears to be authenticated material at Kew and the " tubercles " are very obscure, certainly not prominent enough to conflict with the generic description of *Ensete* seeds as " smooth ".

6. **Ensete calospermum** (*F. v. Muell.*) comb. nov. ; *Musa calosperma* F. v. Muell. in Proc. Linn. Soc. N. S. Wales **10** (1885), 355, et in Gard. Chron. ser. 3, vol. **20** (1896), 360.

Notes : The *Gardeners' Chronicle* note cited is supplemented (*ibid.* p. 467) by a drawing (fig. 85) which by printer's error is titled " Inflorescence of *Musa alosperma* ". The error is worth notice because the combination " *Musa alosperma* " has found its way into *Index Londinensis.*

Baron von Mueller's very interesting species from New Guinea was overlooked by Baker, and so far as I can determine by Schumann, and De Wildeman only lists it, but it seems to be as true an *Ensete* as any African representative.

In connexion with the occurrence of this species in the Pacific, attention may be drawn to a note by H. B. Guppy in " *Observations of a Naturalist in the Pacific* " (p. 436) as follows : " The occurrence in Fijian beach-drift of the seeds of Musa Ensete, or of a wild banana much like it, is very remarkable . . . . . The empty seeds are frequent on the beach at Duniua at the mouth of the Ndreke-ni-wai in Savu-savu Bay, Vanua Levu, and are doubtless brought down by that river . . . . . They answer to the description and the figure given by Schumann for Musa Ensete ; and their presence in the drift is one of the mysteries of the Pacific Floras ". From this it appears possible that either *E. calospermum* is fairly widespread in the Pacific, or it has close relations in that region.

7. **Ensete proboscideum** (*Oliver*) comb. nov. ; *Musa proboscidea* Oliver in Hook. Icon. Pl. **18,** t. 1777 (1888) ; Baker *loc. cit.* 207.

8. **Ensete lasiocarpum** (*Franchet*) comb. nov. ; *Musa lasiocarpa* Franchet in Morot, Journ. de Bot. **3** (1889), 329 ; Baker *loc. cit.* 208.

Note : This extremely interesting species needs much further study. Baker referred it to *Eumusa,* presumably because it is described as having a rhizome, for it has scarcely any other character of *Eumusa.* Franchet wrote in his notes with the original description : " Sa végétation souterraine, autant qu'on peut juger par les spécimens envoyés à l'herbier du Muséum, consiste en un gros rhizome de 0 m. 05 à 0 m. 07 de diamètre qui parait se développer horizontalement, sans qu'on puisse dire encore si la plante est monocarpienne et si elle reproduit, ou non, par rejet ".

I have examined herbarium material at Kew which must be the original collection by Delavay. The flowers appear to be borne on a fleshy cone unique among *Musaceae,* but morphologically this is only the axis of the inflorescence unusually developed. Franchet proposed for this species a new section of *Musa,* to be called *Musella,* and it may on further study be found to represent a distinct genus ; but I should not be prepared to separate it, on the existing material alone, from *Ensete,* with which it has close affinity. Whatever it may be, it is certainly not a *Musa, sensu strictiore.*

9. **Ensete buchanani** (*Baker*) comb. nov. ; *Musa buchanani* Baker in Ann. Bot. **7** (1893), 207.

10. **Ensete elephantorum** (*K. Schum. et Warb.*) comb. nov. ; *Musa elephantorum* K. Schumann et Warburg ex K. Schum. in Engler, Pflanzenreich **4,** 45 (Musac.), 14 (1900).

11. **Ensete schweinfurthii** (*K. Schum. et Warb.*) comb. nov. ; *Musa schweinfurthii* K. Schum et Warb. ex K. Schum. in Engl. Pflanzenreich **4,** 45 (Musac.), 14 (1900).

Note : Synonyms of this, according to Hutchinson and Dalziel in *Flora of West Tropical Africa*, Vol. **2,** Part 2 (1936), p. 328, are *Musa chevalieri* Gagnepain in Bull. Soc. Bot. France 55 Mem. 8 (1908), p. 87 ; *M. martretiana* A. Chevalier in Bull. Soc. Acclim. Paris (1907), p. 79, *nomen,* et in Rev. Bot. Appl. **14** (1934), 507 ; and *M. riperti* A. Chevalier, Expl. Bot. Afr. Occ. Franç. (1920) **1,** 632, *nomen. Musa martreti* A. Chev. ex Tribune Hortic. **3** (1908), 38, (reference not seen by me) is apparently *nomen nudum* and probably written in error for *M. martretiana.*

12. **Ensete religiosum** (*Dybowski*) comb. nov. ; *Musa religiosa* Dybowski in Rev. Hort. **72** (1900), 262 ; De Wildeman, Ann. Mus. Col. Marseille ser. 2, **10,** 352 (1912) ; Musa dybowskii De Wildeman (err. cal.) *ibid.* **7,** 245 (1909).

13. **Ensete arnoldianum** (*De Wild.*) comb. nov. ; *Musa arnoldiana* De Wildeman in Bull. Soc. Etud. Colon. Brux. **8** (1901), 339.

Note : *Musá hybrida* Gillet in L'Agronomie tropicale (1909), 29, appears to have been a hybrid between *E. arnoldianum* and *E. gilletii.* I have not seen the original description, but take the information from De Wildeman, who did not know how the hybrid was obtained. The plant is of some interest as the only recorded hybrid in the genus *Ensete,* but in view of the scanty information about it I have not thought a new combination necessary for it under that genus.

14. **Ensete gilletii** (*De Wild.*) comb. nov. ; *Musa gilletii* De Wildeman in Rev. Cult. Colon. **8** (1901), 102.

15. **Ensete wilsoni** (*Tutcher*) comb. nov. ; *Musa wilsoni* Tutcher in Gard. Chron. ser. 3, **32** (1902), 450.

16. **Ensete holstii** (*K. Schum.*) comb. nov. ; *Musa holstii* K. Schumann in Engl. Jahrb. **34** (1904), 121.

17. **Ensete ulugurense** (*Warb. et Moritz*) comb. nov. ; *Musa ulugurensis* Warburg et Moritz ex O. Warburg in Tropenflanzer **8** (1904), 116.

18. **Ensete perrieri** (*Claverie*) comb. nov. ; *Musa perrieri* P. Claverie in Comptes Rendus Acad. Sci. Paris **140** (1905), 1612, *nomen,* et in Ann. Mus. Colon. Marseille ser. 2, vol. **7** (1909), p. 74, descr. cum ic. t. 8.

19. **Ensete fecundum** (*Stapf*) comb. nov. ; *Musa fecunda* Stapf in Journ. Linn. Soc. (Bot.) **37** (1906), 526.

20. **Ensete laurentii** (*De Wild.*) comb. nov. ; *Musa laurentii* De Wildeman Miss. E. Laurent, **1,** 371 (1907).

21. **Ensete bagshawei** (*Rendle et Greaves*) comb. nov. ; *Musa bagshawei* Rendle et Greaves in Journ. Bot. **48** (1910), 169, et t. 506.

22. **Ensete homblei** (*Bequaert*) comb. nov. ; *Musa homblei* Bequaert ex De Wildeman in Ann. Mus. Colon. Marseille ser. 2, vol. **10** (1912), p. 332.

Note : This species is exceptional in the size of its seeds, which are the smallest I have seen in the genus, only 6–8 mm. in diameter. In shape and structure, however, they conform to the general *Ensete* pattern, and from De Wildeman's description there can be no doubt about the affinities of the species.

23. **Ensete davyae** (*Stapf*) comb. nov. ; *Musa davyae* Stapf in Kew Bull. (1913), p. 102.

24. **Ensete ruandense** (*De Wild.*) comb. nov. ; *Musa ruandensis* De Wildeman in Bull. Jard. Bot. Brux. **8** (1923), 111.

25. **Ensete rubronervatum** (*De Wild.*) comb. nov. ; *Musa rubronervata* De Wildeman in Bull. Jard. Bot. Brux. **8** (1923), 112.

UNDETERMINED SPECIES OF THIS AFFINITY.

Two collections from Siam represent one or two undetermined and probably undescribed species clearly of this genus, viz. :

Put 426, Doi Chiengdao, 21 October 1926, affinities apparently with *E. glaucum*, but seeds smaller and more numerous.

Kerr 6271, Mê Chêm, Chiengmai, c. 500 m., 10 July 1922. " Klue Pam Pa ". Described *inter alia* in the collector's notes as having dull red bracts and abundant red juice.

These specimens were examined at Kew in 1938 by the courtesy of Dr. A. F. G. Kerr, and should prove of great interest and importance to the student of *Ensete*.

SPECIES AT PRESENT OF DOUBTFUL AFFINITY.

1. *Musa gigantea* Kuntze, Rev. Gen. 691 (1891). Placed by Schumann in the subgenus Physocaulis " not without hesitation ". The plant described was in a Java garden, and said to be from Sumatra. The habit suggests an *Ensete* sp. but the description of the fruit suggests that the plant was partially sterile, or else had received no pollen (which it would not if the lower flowers were female only and the plant was growing alone). The 8–10 small (1–3 mm.) and pale seeds in a 3–4-angled, scarcely fleshy, fruit strongly suggest failure of fertilization. This must remain " *species dubia* " until more is known about the fruit and seed. Backer does not mention it in his excellent account of *Musaceae* in *Flora van Java*.

2. *Musa imperialis* Hort. Vilmorin. ; Pucci in Bollet. Soc. Tosc. Ort., p. 299 (1906), appears to be a trade name for a species put into commerce, probably as a foliage plant. Original not seen. De Wildeman (1912) lists it as a species of Baker's subgenus *Physocaulis*.

NOTE ON DISTRIBUTION.

Nineteen of the species listed are described from continental Africa and one (*E. perrieri*) from Madagascar, leaving five described extra-African species and one undescribed, the occurrence of the last suggesting that there may well be others yet to be discovered in S.E. Asia. The extra-African species are *E. superbum* recorded in several parts of India, *E. glaucum* ranging from Burma to the Philippines and Java, *E. lasio-*

carpum and *E. wilsoni* from Southern China, and *E. calospermum* from New Guinea. With Kerr 6271 in Siam the distribution is almost continuous from Southern India to New Guinea, but no species have been recorded from Ceylon, the Malay Peninsula, or Queensland. The whole distribution is very interesting, whether considered by itself or in relation to that of *Musa*, which covers much the same range but extends into Ceylon, Malaya and Queensland, and further eastward into the Pacific than *Ensete* has yet been found.

RELATIONSHIP WITH *Musa*.

Speculations about phylogeny are always tempting but not invariably profitable. In *Musaceae* the established facts scarcely justify even cautious theory, but a few remarks are offered as a provocation to further enquiry and discussion.

It would be unsafe to regard *Musa* as " derived from " *Ensete*, and almost impossible to imagine the reverse ; yet the two genera (as indicated by their long accepted association in one) are sufficiently close to allow us to postulate a common ancestral stock at no very remote geological time, and of the two I regard *Ensete* as probably retaining more of the primitive characters of that stock than *Musa*.

Characters which may reasonably be postulated for the primitive stock include large size ; stoloniferous habit ; leaf-bases sheathing but not completely encircling the stem ; gradual transition from foliage leaves to bracts ; persistence of bracts after flowering ; hermaphrodite flowers—at least under the basal bracts, though some differentiation of sex may well go still further back in time, giving staminate flowers only in the axils of the upper bracts ; large seeds relatively few in number.

From a hypothetical stock with those characters, two lines of descent may have diverged. The prime cause of divergence would be in all probability the attainment of a new chromosome balance, though the point of divergence would not necessarily be the point at which the chromosome numbers of the modern genera were established.

Along one line, which survives in *Ensete*, the most striking development was that of the monocarpic habit. In some of the other characters the modern genus shows considerable variation. Some species have retained a large size and some have become much smaller, but the smaller ones retain robust proportions associated with a relatively broad apical meristem, and this may be correlated with the imperfect sheathing of the leaf-bases, which does not afford the mechanical strength necessary for the formation of a slender pseudostem. Some species have developed more than others toward an abrupt change from green foliage leaves to coloured, or otherwise conspicuously different, floral bracts ; none, that I know of, has developed the habit of cutting off and dropping its bracts within a few hours of anthesis, as most *Musa* species do. How many have developed purely female basal flowers is not clear, but hermaphrodite flowers are apparently still common. All have retained an essentially similar seed shape, and most a large seed size ; there are one or two species in which the seeds are smaller than the largest in *Musa*, but these are exceptional.

Along the other line of descent there were more changes. The stoloniferous habit was retained, but the leaf-bases became stem-encircling, and where reduction in plant size took place it was frequently associated with a slenderer habit. Most of the species developed deciduous bracts, quite sharply distinguished from the foliage leaves in form and colour. There was a general tendency towards reduction in the size of the seeds, accompanied by an increase in their number and the development of a rather more fleshy fruit. This line survives in *Musa*, a genus of much greater diversity in all its morphological characters than *Ensete*, yet more restricted in its ecological range.

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CLASSIFICATION OF THE BANANAS.

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II. The Genus Musa L.

The standard classification of the genus *Musa* L. in use at present is primarily due to Sagot (1887), who first suggested " for the rational grouping of the species " a division into three sections : (1) Giant bananas of the type of *M. ensete* ; (2) Bananas with fleshy fruit, often edible, type *M. sapientum* ; (3) Ornamental bananas with upright inflorescences and brightly coloured bracts.

J. G. Baker (1893) treated the genus more formally, but adopted Sagot's division almost unaltered by defining three subgenera as follows :

Subgenus *Physocaulis*. Stem bottle-shaped. Flowers many to a bract. Petal usually tricuspidate. Fruit not edible.

Subgenus *Eumusa*. Stem cylindrical. Flowers many to a bract. Petal ovate-acuminate. Bracts green, brown or dull violet. Fruit usually edible.

Subgenus *Rhodochlamys*. Stem cylindrical. Flowers few to a bract. Petal linear. Fruit usually not edible. Bracts bright-coloured, often red.

Since 1893, at least fifty new specific names have been added under *Musa*, and although a few of them are not valid the group is about twice as large as it was then. In the last twenty years or so genetical and cytological studies have also been prosecuted, which have provided an entirely different standpoint from which to view the classification of the genus—especially with regard to the relationship of the cultivated forms to the wild. A complete revision is overdue : but the difficulties in the way of assembling all the necessary material are formidable, and the best that can be done at present is to outline the plan that the revision should follow.

I have, in the preceding paper (page 97), proposed the transfer of a group of species, including the whole of Baker's subgenus *Physocaulis*, to Horaninow's neglected genus *Ensete*. The present paper suggests a re-grouping of the species remaining within the restricted genus *Musa*, to conform with the findings of cytological and genetical studies of material in the I.C.T.A. *Musa* collection.

In the re-grouping the edibility or inedibility of the fruit is ignored. We now know that " edibility " in the bananas and plantains depends primarily on the occurrence of parthenocarpy—the development of the fruit without pollination of the female flower—with which is always coupled more or less female sterility causing a tendency for the fruit to be seedless (cf. Dodds, 1943). We can find no evidence that parthenocarpy has ever occurred in more than a very few of the many species of *Musa*. Consequently the very numerous parthenocarpic forms in cultivation, though important economically, are taxonomically insignificant ; and undue emphasis on them is a weakness in Baker's treatment. The classification of the cultivated varieties is almost a separate problem from the general taxonomy of the genus, needing a different technique for its solution, and confusion of the two makes both almost impossible.

One division in the new classification has a cytological basis and falls between species having 11 pairs of chromosomes and species having 10 pairs. The difference involves fundamental differences in genetical behaviour and, as far as our experience goes, chromosome number is in *Musa* not only a safe criterion of relationship but the best. It is correlated with many small differences in habit and physiology which collectively make the division easily recognizable in the field—with experience. But many of those differences are easier to recognize than to describe, and simple key characters are very difficult to find in *Musa*. In cases of doubtful classification, therefore, chromosome number must be the deciding factor.

The 11-chromosome species appear to be a relatively close assemblage, but may be divided for convenience on characters similar to those used by Baker into a group having generally many-flowered dull-coloured bracts and a group having generally few-flowered bright-coloured bracts. These groups may also retain Baker's names.

The 10-chromosome species fall much more definitely into two groups. Again one group has usually dull-coloured and the other bright-coloured bracts, but the much more important distinction is that whilst one group retains a seed like that of 11-chromosome species the other has developed a distinctive seed shape which is one of the few simple but reliable diagnostic characters in the genus.

A general description of the genus is now given and the suggested division into sections follows this.

MUSA *L.*

Perennial stooling herbs. True stem remaining short until flowering. Leaves large, blades oblong, petioles long and expanded below into long, sheathing and stem-encircling leaf-bases forming a pseudostem. Inflorescence pendulous, half-pendulous, or erect. Bracts plane or sulcate, convolute or more or less imbricate in the bud, usually deciduous. Flowers in a single row or in two rows to each bract, those of the lower bracts female or hermaphrodite, those of the upper bracts male, sometimes (i.e. in the cultivated or semi-domesticated forms) all functionally sterile. Perianth (according to the usual interpretation) of two parts : a compound tepal (calyx) essentially tubular, but split to the base on the adaxial side, 5-toothed at the apex, or perhaps better described as 3-lobed at the apex with 2 accessory teeth between the main lobes ; and a free tepal (petal or corolla) inserted within the compound tepal and opposite to it (i.e. in the adaxial position). Stamens 5. Ovary inferior, trilocular. Fruit fleshy, with numerous seeds (except in the parthenocarpic forms). Seeds irregularly globose, lenticular, or cylindrical, with a perisperm chamber above the endosperm.

A. Chromosome number $x=11$. Bracts usually more or less sulcate, often more or less glaucous, rarely or never polished, convolute or more or less imbricate in the bud, usually strongly revolute on fading. Seeds occasionally subglobose, more often dorsiventrally compressed, sometimes lenticular, smooth, tuberculate, or irregularly angulate, with a marked or obsolete umbo opposite to the hilum.

1. Inflorescence pendent or semi-pendent from the first, the fruits reflexing in development towards the base of the rachis. Flowers many to a bract, in two series. Bracts commonly dull-coloured, green, brownish or dull purple. Pseudostems commonly exceeding 3 metres high . . . . Section **EUMUSA**
2. Inflorescence erect, at least at the base, so that the fruits do not reflex in development but point towards the apex of the rachis. Flowers few to a bract, usually in a single series. Bracts brightly coloured, often red. Pseudostems commonly less than three metres high . . . . Section **RHODOCHLAMYS**

B. Chromosome number $x=10$. Bracts plane, firm in texture, polished on the outside, rarely or never glaucous, strongly imbricate in the bud, not or only slightly revolute on fading.

3. Seeds sub-globose or more or less dorsiventrally compressed, smooth, striate, tuberculate, or irregularly angulate, with a marked or obsolete umbo opposite to the hilum corresponding to a small perisperm chamber within . . . .
   Section **AUSTRALIMUSA**
4. Seeds cylindrical, barrel-shaped, or top-shaped, marked externally by a transverse line or groove, above which they are warted, tuberculate or variously patterned, below usually smooth ; internally with a well-developed perisperm chamber above the same line, this chamber empty in the ripe seed . . . .
   Section **CALLIMUSA**

Section *Eumusa* Baker may be called the group of the true bananas. It contains the two commonest and most widely ranging species in the genus, *M. acuminata* Colla and *M. balbisiana* Colla, and with them all the cultivated forms that we believe to have been derived from them. These cultivated forms appear, on the evidence at present available, to include all the bananas and plantains originating in India or Malaysia; which for practical purposes means nearly all the bananas and plantains of the world. They certainly include all the important varieties commonly found in cultivation. Among them *M. paradisiaca* L., as the entity first named in the genus by Linnaeus, may be regarded as the " type species ", although a seedless cultivated form.

Of the 14 species referred to this section by Baker, four are edible forms correctly classified but not valid species ; one (*M. discolor* Horan.) is a dubious entity ; two (*M. lasiocarpa* Franchet and *M. glauca* Roxb.) belong to *Ensete* Horan. ; two (*M. textilis* Née and *M. fehi* Bert. ex Vieill.) certainly belong to the new section *Australimusa* ; two more (*M. hillii* F. v. M. and *M. fitzalani* F. v. M.) very probably belong to *Australimusa* likewise, but are not very well known and cannot be referred with complete confidence. These transfers and reductions leave only *M. acuminata* Colla, *M. banksii* F. v. M. and *M. basjoo* Siebold, to which I add *M. balbisiana* Colla included by Baker in *M. sapientum* L.

Of species added since 1893 I refer here *M. nagensium* Prain, though it is a peculiar type which may later prove to represent a subsection. We have in the I.C.T.A. collection one undescribed species from Burma which is certainly a *Eumusa*. Thus, excluding cultivated forms, the section as I now recognize it contains at least six valid and distinct species, of all of which we have living material.

On complete revision a large number of binomials will have to be considered, many of which are doubtless synonyms of one or other of our six species. A few probably represent distinct entities but cannot at present be classified on account of incomplete descriptions. Several herbaria contain unidentified material clearly referable to this section, but there is no advantage to be gained in *Musa* from basing new species on dried specimens. These collections are chiefly useful as indications of localities in which living material should be collected for study. They also serve to warn us that our knowledge of the genus is still only fragmentary.

The six well known species are all tall plants, flowering at 3–5 metres or more. Three of them are as robust in proportions as many cultivated bananas, though their fruits are smaller. The other three are slenderer, but still so banana-like that no further description of their habit is necessary.

The two common species have a wide distribution. *M. balbisiana* occurs in Ceylon, India, Burma, Siam, Malaya, Java, and the Philippines to New Guinea, with little apparent variation throughout its range. *M. acuminata*, as I understand it, occurs in Assam, Burma, Siam, Indo-China, the Malay Peninsula and Archipelago, and the Philippines, with very great variation from district to district and even within countries. The others are more localized : *M. banksii* is known from Queensland, New

Guinea and Samoa ; *M. basjoo* comes from the Liukiu Archipelago but is chiefly known from cultivated specimens in botanical gardens ; *M. nagensium* occurs in Assam and Burma, with a related form in Sikkim ; our undescribed species is so far known only from one locality in Burma. The general conclusion to be drawn from the known distribution is that the most probable centre is the region of Burma-Siam-Indo-China, which region as well as the Malay Archipelago probably contains several undescribed species.

Section *Rhodochlamys* Baker has its oldest and best known representative in *M. ornata* Roxb. It contains, so far as known, no species having parthenocarpic forms, and no edible bananas are referable to it. Baker erred seriously in referring to *Rhodochlamys* the plant described by Jacquin as *Musa maculata*, which is an edible banana quite definitely belonging to *Eumusa* and not a valid species at all. His description of *M. sumatrana* Becc. is puzzling, and I suspect that Beccari's plant is referable to *Eumusa*, though Baker's description may include a *Rhodochlamys* species.

Of Baker's nine other species, *M. coccinea* Andr. and *M. salaccensis* Zoll. are now transferred to the new section *Callimusa* and seven remain, namely, *M. ornata* Roxb. (misnamed by Baker *M. rosacea* Jacq.), *M. mannii* Wendl., *M. velutina* Wendl. & Drude, *M. sanguinea* Hook. f., *M. rosea* Baker, *M. rubra* Wallich ex Kurz, *M. aurantiaca* Mann.

Of species described since 1893 and referred to *Rhodochlamys* by their authors I accept none, but refer most of them confidently and the rest tentatively to *Callimusa*. We have, however, in the I.C.T.A. collection one undescribed species from Burma to add, making at least eight in the section, of which we have living material of four.

All are relatively small plants, flowering at 1–2 metres or even at less than a metre high. With this small stature they are correspondingly slender and (so far as the habit has been described) stool freely, forming clumps. The section is defined by the small size, erect inflorescence, and few flowers to a bract, and none of these seems a fundamental character. The petal character included by Baker is variable, five species having the free tepal nearly as long as the compound tepal, and three having it much shorter and more of the shape found in *Eumusa*. It is not possible at present to say whether this feature is correlated with differences in genetical behaviour or not.

The known distribution of the section is Chittagong, Assam, Burma and Siam, with four of the species known only from Assam and none of them apparently widespread. It may extend to Indo-China, and does so if my tentative reference of *M. angcorensis* Gagnep. and *M. splendida* A. Chev. to *Callimusa* is wrong ; but it is fairly certainly narrower than that of *Eumusa*.

Section *Australimusa* (Musae bracteis valde imbricatis nitentibus, seminibus irregulariter subglobosis vel dorsiventraliter depressis angulosis) is typified by *M. textilis* Née. Until quite recently I regarded this species as anomalous, because it has the chromosome number and the polished bracts of *Callimusa* with a seed like that of *Eumusa*. An observation by K. S. Dodds (1946) on *M. fehi* Bert. ex Vieill. and chromosome counts by him of several recent accessions in the I.C.T.A. collection brought us to realize that the same combination of characters is shared by a group of species hitherto confused with *Eumusa* but manifestly distinct genetically.

The occurrence of parthenocarpy in *M. fehi* (under which name there may be more than one species confused) has helped to obscure the position, as it has been natural in the past to regard all forms of *Musa* with edible fruits as fairly closely related. It is now clear that the "fehis" of the Pacific are distinct from the true bananas originating further west and common in cultivation throughout the tropics. Incidentally, the fehis though edible are scarcely cultivated. The relationships of the apparently indigenous bananas of Hawaii described by Pope (1926) remain obscure ; and until they are determined, no statement can be safely made about the incidence of parthenocarpy in *Australimusa* as a whole, because some of the Hawaiian forms may conceivably be referable here. But in any event the development of parthenocarpy in this section as well as in *Eumusa* looks like a case of parallel evolution.

The section contains at least five and possibly eight or more distinct species. We have three in the I.C.T.A. collection, in addition to *M. textilis*. One was received from New Guinea as *M. peekelii* Lauterbach and is probably that species ; the other two await description, and one of them, from Halmaheira, is certainly new. Since recognizing the existence of this section, I have little doubt that *M. hillii* F. v. Muell. and *M. fitzalani* F. v. Muell. will prove to belong to it when better known ; as also the imperfectly described *M. maclayi* F. v. Muell. from New Guinea, which may possibly be conspecific with one of our undescribed species.

All the species seen have rather bright green pseudostems, and a habit from which they can be recognized as distinct from other *Musa* spp. even in the vegetative state, though it is not easy to define the causes of the distinctness. One contributory factor is an absence of wax bloom from the upper parts of the leaf-sheaths, which allows the green colour full expression. Another is the tough fibrous nature of the leaf-sheaths (commercially important in *M. textilis* but shared by the others) by virtue of which the older and dead sheaths peel away cleanly, exposing the green pseudostem beneath, in contrast to *Eumusa* where the dead sheaths usually persist in a tattered condition and conceal the colour of the lower part of the pseudostem. A third factor in appearance is that in actively growing shoots each leaf-sheath is further exserted beyond the next older one than in most *Eumusa* spp. The sum of these characters is a very distinct facies.

The inflorescence may be pendent, semi-pendent, or erect ; and within this group its attitude does not appear to be connected with any fundamental genetic differences, though on this point we have little information. The flowers may be fairly numerous or relatively few (7 or 8) per bract, and in our *M. peekelii* some " hands " of the fruit bunch are biseriate and some uniseriate.

M. textilis is a native of the Philippine Islands ; *M. fehi* is recorded from Tahiti, New Caledonia and Fiji ; our *M. peekelii* and one undescribed species are from New Guinea, like *M. maclayi* ; *M. hillii* and *M. fitzalani* were described from Queensland ; our latest accession in the group is from Halmaheira, N.E.I. Thus the section is mainly

Australasian, and the fact seemed worth signalizing in its name. At present only one certain species of *Eumusa* is known east of New Guinea (viz. *M. banksii*, ranging to Samoa) and the distributions of the two sections look very different. There are a number of imperfectly known species both in the Malay Archipelago and in the Western Pacific, and further study is needed to demonstrate the limits and extent of overlap of the sections.

Section *Callimusa* (Musae bracteis valde imbricatis nitentibus, seminibus turbinatis, dolioliformis vel cylindraceis) has its best known and oldest representative in *Musa coccinea* Andrews, and is named partly from the fact that that species is the most ornamental in the genus and partly in recognition of the beautifully coloured bracts of other members.

Of species known to Baker, two can be referred here with confidence, namely *M. coccinea* itself and *M. salaccensis* Zollinger, the seed of which is well described by Backer in *Flora van Java*. Of species described since 1893, *M. borneensis* Beccari, *M. violascens* Ridley, *M. campestris* Becc. and *M. hirta* Becc. can be referred from their descriptions. In the I.C.T.A. collection we have an undescribed species from Malaya, received as *M. violascens* but not agreeing with the description of that plant. The section therefore contains at least seven good species, of which we have material of three.

Here, as in *Australimusa*, the inflorescence may be either erect or pendulous, and when it is erect the plants simulate *Rhodochlamys* sufficiently to be referred there by collectors unaware of the existence of two distinct series of bright-bracted *Musae*. Consequently there are several species described under *Rhodochlamys* which we cannot definitely place because the essential features have been omitted from the description. I can only tentatively refer here *M. angcorensis* Gagnep. with bracts described as *glaberrimae*, and *M. splendida* A. Chev. of which the bracts are "fortement imbriquées" ; the diagnostic seed character is not described for either.

Like *Rhodochlamys*, *Callimusa* has no known parthenocarpic member or economic species. Its known members vary widely in size and habit. *M. borneensis* is similar in appearance and size to a common banana, and has fruits up to 16 cm. long in a pendent bunch. *M. coccinea* flowers at a metre high or less, and on account of its small size is popular in conservatories in temperate countries : its inflorescence is erect, very short and compact, and with its narrow bracts and very "open" bud (several bracts exposing their flowers simultaneously) it is very un-banana-like in appearance. The other species are intermediate between these extremes. They vary much also in number of flowers per bract, both biseriate and uniseriate flowers occurring ; and *M. coccinea* with 2–3 flowers only in each axil is the extreme case of reduction in this respect. Some of the species have a conspicuous corrugated auricle at the base of the petiole, not noted elsewhere in the genus : others are described as having the leaf-blade decurrent on the petiole. The three studied on living material resemble members of *Australimusa* in the firm texture of their bracts and leaf-sheaths.

M. coccinea was described from China and has been recorded as abundant in Indo-China ; *M. salaccensis* is known from Java and Sumatra ;

M. violascens and our undescribed species are from the Malay Peninsula ; Beccari's three species are all described from Borneo. The distribution indicated by these seven species is fairly distinct from that of *Rhodochlamys* and has its probable centre a good bit to the south-east. The identification of *M. angcorensis* and *M. splendida* is important in defining the distribution of *Rhodochlamys* as they both occur in Indo-China. But in any case *Callimusa* and *Rhodochlamys* certainly overlap in Siam, for I have seen unidentified herbarium specimens of both affinities from that country.

It seems worth mentioning here that the *Rhodochlamys* species occurring in Siam (represented by *Kerr* 6143 and *Kerr* 4561 in Dr. A. F. G. Kerr's collection) must have a strong superficial resemblance in the field to *M. coccinea* Andr., as it has an erect inflorescence and similar red bracts similarly arranged in the terminal bud. Only the seed is entirely different. This may be *M. rubra* Wall. ex Kurz, which was described from Bùrma and said by Baker to have the habit of *M. coccinea*, but to differ by its short petal. Not being familiar with *M. rubra*, I hesitate to make the identification, but the pair of species seems to afford a very interesting example of parallel evolution, and illustrates the necessity for examining the seed (or the chromosome number) before definitely referring a species to its position in *Rhodochlamys* or *Callimusa*.

The *Callimusa* species occurring in Siam is represented by *Kerr* 7431 and *Kerr* 7431 A, Betong, Pattani (1923). The inflorescence is of the slender erect type with the flowers in a single series in each bract ; mature fruits are 10 cm. long, 1·5 cm. in diameter in the dry state ; the seeds are pyriform, of typical *Callimusa* structure. The plant has evident affinities with *M. salaccensis* Zoll.

RELATIONSHIP OF THE SECTIONS

The groups have deliberately been called sections rather than subgenera in an attempt to avoid the implication that they are of equal rank. I am inclined to regard the division between *Eumusa* and *Rhodochlamys* as unessential, though it is convenient to maintain as long as it remains as well marked in the field as it is at present. On the other hand the seed of *Callimusa* almost justifies its segregation as a distinct genus, and would do so were not *Australimusa* intermediate in some characters between it and *Eumusa*.

Light on relationships, both within and between the sections, is most likely to be obtained from cytogenetical studies of species crosses. Five species of *Eumusa*, four of *Rhodochlamys*, one (*M. textilis*) of *Australimusa* and three of *Callimusa* have been experimentally crossed in various combinations and numerous species hybrids have been raised, but the big task of analysing their behaviour will take years to complete and few generalizations can yet be made. Those given here are tentative.

As might be expected, 11-chromosome species and 10-chromosome species do not cross readily. In fact whenever the 10-chromosome species has been used as female parent numerous pollinations have failed to set fruit at all ; several hybrids have been obtained when *Eumusa* species were the female parents but few of them are vigorous. Crosses between species of the same chromosome number are usually effected readily, but not always ; and there are differences in behaviour in this respect, not only between species but between varieties. *M. balbisiana* combines with almost anything, which is very interesting in view of its wide range, well-defined nature as a species, and relatively narrow variation.

One of the most interesting tentative findings, though it needs much more testing for confirmation, is that *Callimusa* species do not cross more readily with *Rhodochlamys* than with *Eumusa*, but possibly the reverse. Only one hybrid *Rhodochlamys* ♀ x *Callimusa* ♂ has yet been raised, but not all the possible combinations have been properly tested. The interest lies in the evidence that may be obtained for or against the view that *Rhodochlamys* and *Callimusa* have evolved from *Eumusa* and *Australimusa* respectively along independent but partly parallel lines.

On other grounds, and especially that of distribution, it seems reasonable to postulate that 11-chromosome and 10-chromosome lines diverged relatively long ago and that *Rhodochlamys* is a relatively recent offshoot of the *Eumusa* line of descent. Neither distribution nor other considerations suggest that *Callimusa* is equally recent. It is in respect of plant size, habit, and flower-number the most heterogeneous of the sections, as *Rhodochlamys* is the most homogeneous : and its differentiation from the ancestral stock of *Musa* may have been independent of that of *Australimusa* and possibly earlier.

These speculations are advanced in the hope that they may stimulate investigation of a genus that is difficult to collect and to study, but sufficiently interesting and important in both its economic and its more strictly botanical aspects to repay the investigator.

The notes to be presented concerning individual species are in many respects incomplete, and their compiler feels that they should be prefaced by a few remarks in explanation.

The genus *Musa* presents peculiar difficulties to the student, and although of great economic importance (containing as it does two series of crop plants, the bananas and the Manila hemps) it remains very imperfectly known and classified. In the first place its geographical distribution is wide, ranging approximately in longitude from 75° E to 150° W and in latitude from 30° N to the Tropic of Capricorn. The area so defined comprises Ceylon and India, Burma, Siam, Southern China and Indo-China, the Malay Peninsula, the whole East Indian Archipelago, Queensland, and many of the islands of the Pacific Ocean. Within this vast territory the ecological distribution of the wild species is mainly in forest areas, and although some of them are characteristic plants of secondary bush, others occur in relatively inaccessible places where opportunities for collection are few.

When found, the plants do not lend themselves to the preparation of useful herbarium specimens. The large inflorescences are usually not numerous, and it is only when material is abundant that the collector is fortunate enough to find all the stages necessary for a complete description. Even then, the size of the organs prevents the collection of more than fragments which, after laborious drying, present a sadly distorted caricature of the living plant.

Hence it comes about that the determination of species and varieties depends largely on verbal descriptions and drawings of varying quality, and it is no matter for wonder that numerous errors have crept into the literature. More than in most genera, living material is the only satisfactory material for study, but few of the species are represented in botanical gardens, and those which can be obtained from botanical collections are, as often as not, wrongly named. The plants are not in general ornamental, their bulk makes them inconvenient to grow in any large numbers under glass in the temperate gardens, and it is only in the last few years that their importance has been recognized to justify the expense of forming and maintaining a collection in the Tropics.

The best collection of *Musa* in the world today is almost certainly that of the Imperial College of Tropical Agriculture in Trinidad, but that contains less than a score of distinct species ; and even of that small number, half a dozen are apparently undescribed, a fact illustrating very clearly the great amount of work remaining to be done before the genus can be considered well known.

Unfortunately, a paucity of material has not prevented the growth of a bulky and confusing literature. The edible bananas (in which term are included plantains) are important foodstuffs to large sections of the human race, and the plants attract the attention of the European traveller or sojourner in the tropics by reason of their unlikeness to anything in temperate floras. Consequently they have not been by any means neglected by botanists, but on the other hand accurate information about the genus as a whole has become confused and obscured by a disproportionate emphasis laid on the cultivated forms, and by erroneous accounts and opinions written by untrained or careless observers.

The seedlessness of the bananas has proved a cause of error to many, even among the botanists. Some have regarded the seedless forms as ranking with the fertile species and have bestowed Latin binomials upon them. Others have preferred to regard them all as varieties of one mythical " species " (usually called *Musa sapientum*) which is supposed to exist somewhere in a wild and fertile condition. Nearly all the older authors have been badly muddled about the efforts of " cultivation " in "improving" the wild forms and leading to the seedless condition. Such mistakes were natural enough before advances in genetics modified many of our views about the origins and taxonomic status of crop plants : they are not peculiar to the genus *Musa*, but they are unusually conspicuous in this group.

A modern view of the genetic system of banana varieties has been presented by K. S. Dodds (*Empire Journal of Experimental Agriculture* **11,** 89-98 : 1943). Briefly, we now believe that " edibility " in the fruits of *Musa* spp. depends primarily on the occurrence of parthenocarpy, which is a genetic property preserved, but not induced, by domestication. With parthenocarpy there is always coupled a degree of female sterility and comparative seedlessness. In nearly all cultivated forms the sterility has become more absolute by the accumulation of structural changes in the chromosome mechanism during centuries of vegetative propagation. In many of them, though not in all, the reproductive mechanism is further complicated by polyploidy, the majority of the recognized horticultural varieties being triploids.

From the systematic point of view, the important finding is that as far as we can determine at present parthenocarpy has occurred in only three species of the whole genus *Musa*, and practically all the very numerous bananas and plantains described or mentioned in the literature descend from only two species. Some 30–40 Latin binomials applied by various authors to parthenocarpic forms can therefore be rejected as superfluous, and the cultivated members fall into true perspective as a side issue from a genus that probably contains some 40–50 valid, fertile, diploid species in the wild state.

The last good revision of the genus was made by J. G. Baker in 1893 (A synopsis of the genera and species of Museae. *Ann. Bot.* **7** : 189-222). It was made possible by the fact that there was in cultivation at Kew at the time an excellent collection of living material—the *Kew Bulletin* of 1894 lists no less than 25 different forms, including some banana varieties, with an asterisk denoting that examples were in cultivation—and stands in an entirely different class from some other accounts of the genus that have obviously been written entirely in the library. This has remained the standard treatment for more than fifty years, and its only general defect is that it is too concise for the importance of its subject, lacking explanatory notes so that the student is often left in doubt about the nature of evidence on which statements are made.

Since 1893, not only have about 50 new specific names been added to the genus, but genetical and cytological studies have thrown much light on relationships within it. A new revision is therefore overdue. But as modern researches have simplified the problem in some of its aspects, they have complicated it in others and revealed gaps in the available information such that any formal revision at the present moment would be likely to be out of date almost as soon as it was in print.

Materials for a revision have been collected over the last twenty years, and since they are still inadequate for their purpose it has seemed desirable to make them available to botanists who may be willing to assist in the task if provided with a statement of the present position and pointers to the various outstanding questions. As preliminaries I have recently proposed the transfer of some 25 species to the genus *Ensete* Horan. (p. 97), and the arrangement of those that remain in four sections of *Musa* instead of the two sections that were enough for the material known to Baker (p. 108). The most convenient way of presenting the remaining notes has seemed to be by taking the better known species one by one and bringing together for each as much information as there is available.

In nearly every case there is some new knowledge that has accrued from the observations of the banana research team at the Imperial College of Tropical Agriculture but has not hitherto been published. In some cases the observations serve to round off incomplete descriptions, in others they require a complete re-orientation of the older data. Personal opinions and interpretations are inevitably involved, and some care has been taken to indicate where they begin and end, in an endeavour to avoid further confusion of a literature already containing too much opinion and too little fact.

Because much of the difficulty in studying *Musa* arises from the scattering of the literature in relatively inaccessible publications, these notes contain extensive transcriptions of important material from the older works. The aim has been to provide other workers on the genus with sufficient data for them to draw their own conclusions where they may be at variance with the compiler. There may be some overlap between the treatments of individual species : it has seemed desirable at this stage to make each article as complete as possible in itself.

For the photographs illustrating the notes I am indebted to Dr. K. S. Dodds, who has taken great pains to bring out the diagnostic features. The parts chosen for illustrations—fruit bunch and male bud—are those that in our own experience we have found most useful for recognition of species. A " banana-like " habit is so general that habit photographs as a rule show very little that cannot be conveyed equally well by words and figures, and they have therefore been omitted.

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The first of the Notes on individual species of *Musa* will appear in the next issue of the *Kew Bulletin.*

THE SYSTEMATIC POSITION OF THE GENUS PYCNOBOTRYA.

F. MARKGRAF.

The apocynaceous genus *Pycnobotrya* was established by Bentham in Bentham & Hooker, Genera Plantarum, **2**, 715 (1876), and figured in Hooker's Icon. Plant. **12**, 72, t. 1183 (1876). It is represented by one species in Gaboon (*P. nitida* Benth.) ; one other species, which Stapf described in the Flora of Trop. Afr. **4** (1), 203 (1902), from the Cameroons (*P. multiflora* Stapf), is scarcely distinct from the first one. The genus is not mentioned in the Flora of West Tropical Africa by Hutchinson and Dalziel and its position has not been reviewed since Stapf. Bentham had inserted *Pycnobotrya* among the *Echitoideae*, in which sub-family the anthers stick tightly to the stigma head and have an arrow-like appearance on account of their acute, not dehiscing tails. In this sub-family, however, there are ovaries with numerous ovules giving rise to comose seeds. Stapf, however, had appreciated that in *Pycnobotrya* there were only 4 ovules in each loculus, and that the 2 upper ones seemed to decay early. In the meantime Zenker distributed fruiting material from Bipinde, Cameroons (No. 3021a), as a result of the examination of which I am driven to the conclusion that the genus must be removed from the *Echitoideae*. These fruits resemble in the highest degree those of the American genus *Aspidosperma* Mart. & Zucc. The mericarp is 5 cm. long, 3·5 cm. broad, 1 cm. thick, dry, flat, elliptic with a curved excentric flank line that runs from the calyx to an inconspicuous tip (the remains of the style) : the outer side is opaque and dotted with a few small warts, the inner side is shining and very wrinkled. Clasping along the back edge it shows inside 2 oblong-elliptic seeds 4·5 cm. long, 3 cm. broad and scarcely 1 mm. thick. Each of them is surrounded by a papery wing about ½ cm. broad and somewhat radially striped, and attached by a 2 cm. long funiculus, originating at their middle. The point of attachment of this is to be found at the transverse edge of each fruit valve, on the one at the upper edge, on the other of the same mericarp at the lower edge. Within the seed there lies as in *Aspidosperma* a flat embryo with huge (3 × 2 cm.), bluntly cordiform cotyledons and a short, blunt radicle (3 mm. long) embedded between very scanty remains of endosperm. Such a type of fruit is known in Africa as yet only in the genus *Diplorrhynchus* Welw., which is a near ally of *Aspidosperma*. By all these characters *Pycnobotrya* is kept quite apart from the *Echitoideae*. This view is strengthened by examination of the flowers. The oblong corolla lobes (agreeing with Bentham's description) open only to a funnel-shape as in *Aspidosperma* and *Diplorrhynchus* (Bentham's figure shows apparently a young bud that has been opened artificially). The anthers do not stick at all to the stigma head ; their tips are very acute, it is true, but their bases are bluntly cut and clasp to the very base. The stigma head is shortly cylindric and is crowned by two short, blunt, somewhat-spreading lobes. All these characters agree quite well with *Diplorrhynchus*, likewise the short corolla tube ; only the style of *Pycnobotrya* is shorter. The fruit is broader, the seeds are not obliquely oblong, and the embryo is not situated excentrically.

I therefore consider that *Pycnobotrya* Benth. is better placed near *Diplorrhynchus* in the sub-family *Plumerioideae*.

A NEW GENUS OF CUCURBITACEAE.

D. CHATTERJEE.

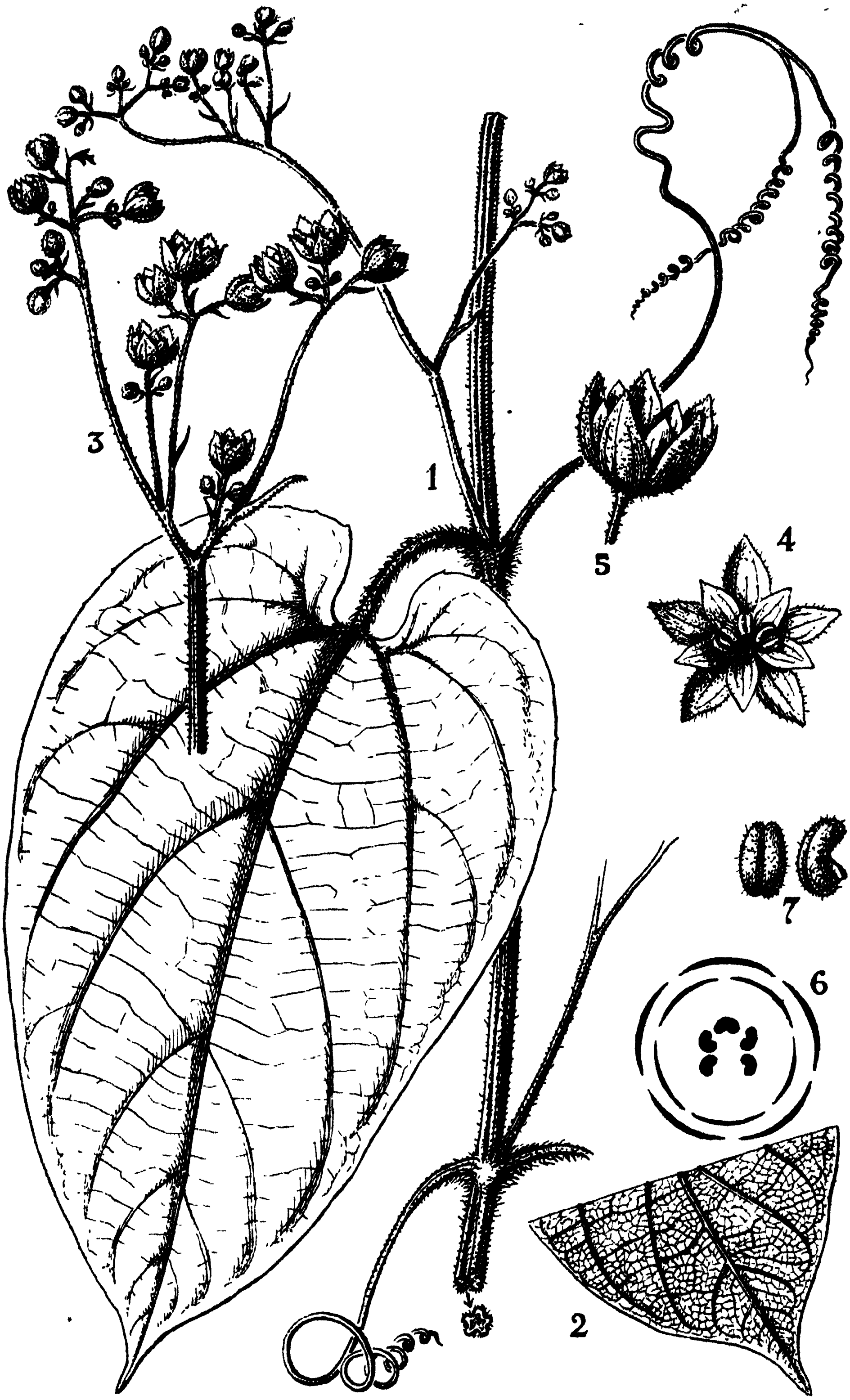
The family *Cucurbitaceae* is represented in India by 86 species and is widely distributed in various parts. There are only three genera which are localised and endemic in India, viz., *Biswarea* Cogn. and *Edgaria* C. B. Clarke of the Himalayas and *Dicaelospermum* C. B. Clarke of Bombay and Malabar. A fourth endemic genus is described in this paper, and this comes from the botanically rich area of Assam. The plant was first collected by Mann in 1883 in Khasia Hills and North Darrang, then by Burkill in 1911 in Abor Hills, and lastly by Dr. N. L. Bor in 1933 from the Aka Hills. The last three areas form a continuous chain of low-lying hills at the base of the Bhutan Mountains. Mann's collection was examined by Clarke at the Kew Herbarium as early as 1895. He wrote on one of the sheets " genus unknown ; it is put in Kew as *genus ignotum*, but I think it *Zanonia* species." An examination of further materials was made along with that of Mann's sheets and it was soon found that the plant could not be *Zanonia* as suggested. This is due to the fact that the flowers have five free sepals and large flat, smooth, compressed seeds as against the three sepals and winged seeds of *Zanonia*. There are other differences as well, and the only apparent similarity is in respect of the broad, simple, coriaceous leaves of *Zanonia indica* Linn.

The new genus described below has some affinity with *Thladiantha* Bunge (as described under tribe *Fevilleae* in Cogniaux's monograph on Cucurbitaceae in the Pflanzenreich, **4,** 275-1916). Similarities are evident in respect of the leaves specially with *Thladiantha calcarata* (Wall.) C. B. Clarke, dioecious flowers, five free stamens of which four are associated in two pairs, indehiscent fruit and seeds. But in respect of the larger free sepals, absence of basal scale, almost sessile stamens with reniform hairy anthers, and absence of pistillodes, as well as in the much larger fruit, the new genus differs distinctly from *Thladiantha*.

The five free lanceolate and acute sepals which are always larger than the five petals, and the short stamens with unilocular anthers, are very characteristic of this new genus. Unfortunately the female flowers have never been collected and so the distribution of the ovules within the ovary is not known. When this is known, the relationship of the new genus with *Thladiantha* and other genera of the tribe *Fevilleae* will be better understood. There is, however, no difficulty in placing the new genus under the above tribe in view of the five free stamens.

Indofevillea *Chatterjee* gen. nov., affinis *Thladianthae* Bunge, sed sepalis petala longe superantibus squamis floribus nullis, antheris subsessilibus, reniformibus, hirsutis, pistillodio nullo, fructuque multo majore satis discrepat.

Frutex scandens ; folia petiolata, ovata, basi cordata, margine integra ; cirri laterales, apice bifidi. *Flores* dioici, masculi tantum cogniti, omnibus partibus minute puberuli ; pedunculi elongati, pedicelli brevissimi. *Sepala* acuta petalis acutis multo longiora. *Pistillodium* nullum. *Stamina* 5, libera ; antherae reniformes, subsessiles, uniloculares. *Fructus* indehiscens ; semina complanata ovata. Species unica Assamica.



Indofevillea khasiana Chatterjee

1, 2, × ½. 3, natural size. 4, 5, × 2½. 7, × 7.

Indofevillea khasiana *Chatterjee* sp. nov.

Extensive *climber* with five-ridged stem. *Stem* scabrid and sparsely villous with long multicellular hairs, stout and woody below with thick spongy bark. *Leaves* simple, petioled, alternate; lamina broadly ovate, cordate at the base, apex shortly acuminate, 21–27 cm. long, 13–17·5 cm. broad, margin usually entire, very rarely in some young leaves distantly and minutely toothed near the base, scabrid on the veins, otherwise glabrous on both surfaces ; venation slightly raised on the upper surface, at least when dry, more distinctly so beneath; petiole stout, 1·5–8 cm. long, densely puberulous, and sparsely villous with rather stiff hairs. *Tendrils*, one with each leaf, about 20–30 cm. long, bifurcating in the apical third. *Inflorescence* axillary, about 17 cm. long, branched corymbose, peduncle and branches scabrid; bracts linear, acuminate, 5–9 mm. long, bracteoles 2–3 mm. long. *Flowers* unisexual, regular, pedicellate, pedicel scabrid. *Male flowers* :—*sepals* 5, free, equal, ovate, lanceolate with three or four nerves in each, always larger than the petals, 6 mm. long ; *petals* 5, free, regular ovate-lanceolate, 3–5-nerved, sparsely and minutely hairy outside and papillose within, 4 mm. long ; *stamens* 5, free, of which four stamens are associated in two pairs (but not united), subsessile, filaments very short, anthers reniform, unilocular, sparsely hairy ; staminodes or pistillodes absent. *Female flower* not seen. *Fruit* (young) oblong, 10 cm. long, 3·5 cm. broad ; (mature fruit) in clusters of 3–6 on a long stalk, 30 cm. long, fleshy indehiscent, with a thick woody rind. *Seeds* many, large, ovoid, compressed, faintly marginate, 3·5–4 cm. long, 2 cm. broad.

ASSAM. Khasia Hills, (?) *G. Mann* without number (two sheets) ; type in Herb. Calcutta.

Charduar Forest, Darrang district, *G. Mann* without number ; three sheets in Herb. Kew.

Abor Hills, scrubby clearing near Rotung, alt. 530 m., 24 Dec., 1911, *Burkill* 37363 ; south of Libong stream, alt. 900 m., 8 Jan., 1912, *Burkill* 37742 (Herb. Calc., one sheet in Herb. Kew, see Rec. Bot. Surv. Ind. **10,** 1925, p. 287).

Aka Hills, above Painjuli, 1000 m., 3rd week of April, 1933, *N. L. Bor* (two sheets in Forest Herbarium, Shillong, No. 633, and two sheets in Herb. Calc.).

REVIEW

Les Plantes Cultivées (Histoire-Économie).*—The name of this book implies that it deals with the history of economic plants, but in fact it covers a much wider field. The first chapter gives a general account of the origin of many important economic plants and of the manner in which they are presumed to have been dispersed to the various regions where they are now grown, from ancient times to the present day. Groups of plants are dealt with in more detail in the next eighteen chapters. The plants are classified according to their usage and include not only those of temperate regions, but also of the tropics and subtropics. Thus under cereals we find wheat, barley, rice, millets, all included together with some of the lesser known cereals. Other chapters deal with legumes and tubers, industrial plants which include fibres, dyes, tannins, insecticides, rubbers. Forage crops are grouped together and comprise natural and artificial pasture and fodder crops. There is a chapter on perfumery plants and on cover crops. There are others dealing with ornamental plants, shade and avenue trees and forest trees, poisonous weeds and so on. Finally, there are chapters devoted to an account of new methods of cultivating and improving plants with brief references to the effects of vernalization, the use of auxines and hormones, soilless culture and similar matters. Another section gives a brief account of the improvement of plants by selection, hybridization and variation. There is a great deal of interest in this book and the reader is intrigued in particular by references to plants which are rarely in the public notice and of which one would have liked to know more. Limitations of space have obviously prohibited the writer from giving more details of such plants, but having whetted the appetite it would have been useful if it had been found possible to give a list of references, so that the reader interested in a particular plant might have the opportunity of going deeper into the matter. Within these limits the book, which covers 349 pages, is a useful one for reference, but the subject is so vast that one cannot help feeling that it would have been better to split up the subject matter into two or three volumes each dealing with a separate section.

G. EVANS.

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* By A. Guillaumin. Payot, Paris 1946, pp. 352, *fcs.* 250.

AFRICAN ORCHIDS : XVII.

V. S. SUMMERHAYES.

The first eleven numbers of this series appeared in the Kew Bulletin (for No. XI see Kew Bull. 1939, pp. 489–500), but as during the war the Kew Bulletin stopped publication the next five numbers were published in the Botanical Museum Leaflets, Harvard University, as follows, XII, **10,** 257–299 (1942) ; XIII, **11,** 137–170 (1943) ; XIV. **11,** 201–214 (1944) ; XV, **11,** 249–260 (1945) ; XVI, **12,** 89–116 (1945).

The present contribution contains descriptions of a number of new species, especially from the interesting and valuable collections made by Mr. & Mrs. R. E. Moreau in Tanganyika Territory, and by Dr. Paul Jaeger, of Dakar in French West Africa, in the Loma Mts. in northern Sierra Leone. The specimens collected by Dr. Jaeger were kindly sent to me for determination and contain numerous extensions of range of species into Sierra Leone as well as the new species. The type specimens of all the species described in this paper are in the Kew Herbarium.

Orchis maderensis *Summerhayes*, nom. nov. *Orchis foliosa* Solander ex Lowe (Prim. Flor. Mader.) in Trans. Cambr. Phil. Soc. **4,** 13 (1831), non Swartz.

The trivial name *foliosa* cannot be used for this well-known Madeiran species owing to the earlier *Orchis foliosa* Swartz published in 1800. I have therefore suggested the trivial name *maderensis* which has the advantage of indicating the native country of the species.

Brachycorythis (§ **Eubrachycorythis**) **paucifolia** *Summerhayes*, sp. nov. ; affinis *B. angolensi* (Schltr.) Schltr. et *B. sceptro* Schltr., ab illa foliis majoribus, floribus fere duplo majoribus, labello distincte trilobato, ab hac foliis paucioribus latioribusque, bracteis flores non superantibus, floribus majoribus, petalis latioribus, labello angustiore trilobato satis distinguitur.

Herba terrestris saepius elata, 20–55 cm. alta, glaberrima. *Radices* numerosae, leviter flexuosae, carnosae, circiter 5 mm. diametro, laxe tomentosae. *Caulis* erectus, sublaxe paucifoliatus, basi 5–10 mm. diametro. *Folia* 8–12 ; 2–3 infima vaginiformia, obtusa; 4–6 intermedia suberecta vel subpatentia, lanceolata, oblongo-lanceolata vel elliptico-lanceolata, apice obtusa vel acuta, apiculata, 5–17 cm. longa, 1·5–3·5 cm. lata, ± conduplicata ; 2–3 superiora minora, lanceolata, acuta vel acuminata, 3–5 cm. longa, bracteis similia. *Inflorescentia* simplex vel rarius ramo brevi instructa, dense multiflora, 5–11 cm. longa, 3·5–5 cm. diametro ; bracteae foliaceae, lanceolatae, acuminatae, inferiores flores aequantes, superiores sensim decrescentiae. *Flores* pro genere inter majores, suberecti, de colore nil constat ; pedicellus cum ovarium 1–2 cm. longus. *Sepalum* intermedium elliptico-lanceolatum, obtusum vel rotundatum, 10·5–14·5 mm. longum, 6–7 mm. latum, concavum ; sepala lateralia oblique ovato-lanceolata, obtusa vel apiculata, 11–16·5 mm. longa, 4·75–7 mm. lata ; sepala omnia quinquenervia, nervis transversis numerosis, marginibus breviter involutis. *Petala* valde oblique lateque ovata, obtusa vel acuta, basi margine antica valde dilatata, margine postica cum columna breviter adnata, 10·25–14 mm. longa, 7·25–8·75 mm. lata, 5–6-nervia, nervis exterioribus multo ramosis. *Labellum* basi

saccatum vel breviter calcaratum ; lamina (epichilium) sessilis, lateribus reflexis, ± obovata vel orbiculari-obovata, antice ± truncata distincte trilobata, in toto 9–15 mm. longa, 7·25–10·5 mm. lata, carina mediana humili instructa ; lobus intermedius semi-orbicularis, ellipticus vel fere triangularis, rotundatus, 1·75–4 mm. longus, 2·25–4·75 mm. latus ; lobi laterales quam intermedius breviores, lati, rotundati ; calcar (hypochilium) semisphaeroideo-conicum, obtusissimum, 2–4·5 mm. longum. *Columna* basi cum labello adnata, brevis, crassiuscula, 4–5 mm. alta ; antherae loculi adscendentes, paralleli, contigui, canalibus subnullis ; pollinia clavato-obovoidea, caudiculis 1·5 mm. longis, viscidiis fere orbicularibus 0·75 mm. diametro ; staminodia sessilia, orbiculari-oblonga ; rostelli lobus intermedius brevis, conduplicatus, lobi laterales breves, truncati ; stigma excavatum.

SIERRA LEONE. Loma Mts., in montane grassland, Aug. 1945, *Jaeger* 975; 1027; 1132; 1278; 1327 (type).

This very interesting species is evidently a common inhabitant of the grasslands occuring above the forest belt in the Loma Mountains.

B. paucifolia seems correctly placed in Schlechter's section *Eubrachycorythis* in view of the glabrous flowers and the general lip-structure. Within this group it appears to be most closely allied to *B. angolensis* (Schltr.) Schltr., both species possessing a comparatively small number of leaves, in which respect they differ from most other species of *Brachycorythis*.

The Sierra Leone species approaches more closely than does any other species the section *Basiphyllum* in which there are long radical leaves. In *B. paucifolia* the main leaves, however, although rather long, are borne in the centre of the stem, while in floral structure it differs in important respects from *B. basifoliata* Summerh. Nevertheless the present species may be looked upon as intermediate between the normal types of *Brachycorythis* and the section *Basiphyllum.*

Habenaria (§ **Multipartitae**) **jaegeri** *Summerhayes,* sp. nov. ; ex affinitate *H. mannii* Hook.f. et *H. splendentis* Rendle, ab utraque labelli lobis lateralibus subpalmatim pectinatis, stigmatum parte receptiva sessili, ab illa calcari duplo longiore, ab hac foliis anguste lanceolatis facile distinguenda.

Herba terrestris, erecta, circiter 70 cm. alta, sicco nigrescens ; tuber ellipsoideum, 3 cm. longum, fere 2 cm. diametro ; caulis validus, teres, 5–7 mm. diametro, basi cataphyllis 4 ± arcte vaginantibus apice acutis fere omnino obtectus, medio foliatus, in inflorescentiam terminans. *Folia* circiter 6, suberecta, e basi vaginante lineari-lanceolata vel lanceolata, acuminata, 10–20 cm. longa, 1·5–2 cm. lata, glabra, subtus prominenter trinervia. *Inflorescentia* 13 cm. longa, 7 cm. diametro, subdense circiter 12-flora ; bracteae foliaceae, magnae, lanceolatae, acuminatae, flores fere aequantes, 3–4·5 cm. longae, circiter 1 cm. latae, subtus prominenter trinerviae. *Flores* magni, suberecti ; pedicellus cum ovario circiter 2 cm. longus. *Sepalum* intermedium lanceolato-ovatum, apice apiculatum, circiter 2 cm. longum et 1 cm. latum ; sepala lateralia valde oblique lanceolata, apice acuminata, basi subito angustata, circiter 2 cm. longa et 7·5 mm. lata ; sepala omnia quinque- vel sub-septemnervia, glabra, marginibus ciliolatis. *Petala* oblique curvatim vel geniculatim ligulato-lanceolata, apice obtusa, 1·75–2 cm. longa, circiter 4·5 mm. lata, tri- vel quadrinervia, glabra, marginibus ciliolatis. *Labellum* ex ungue circiter 5 mm. longo profunde tripartitum, in toto circiter 2·5 cm. longum et 2·75 cm. latum ; partitio intermedia recta, linearis, obtusa, 17 mm. longa, 2 mm. lata, convexa, inferne linea mediana incrassata instructa, puberula ; partitiones laterales inferne divergentes, superne arcuatim incurvatae, anguste flabellato-cuneatae, marginibus exterioribus basi excepta longe pectinatae, inferne puberulae, laciniis circiter 15 linearibus incurvatis 5–11 mm. longis glabris ; calcar sigmoideum, ex ore latiore anguste cylindricum, apice breviter inflatum, obtusum, circiter 3·75 cm. longum. *Antherae* connectivum taeniale, ± hippocrepiforme, circiter 7 mm. latum, dorso 3·5 mm. altum ; loculi reclinati, circiter 3 mm. longi ; canales non visi ; staminodia non visa. *Brachia* stigmatifera dimidio inferiore rostello adnata, dimidio superiore libera curvatim descendentia ; pars libera omnino receptiva, 5 mm. longa ; rostelli lobus intermedius minutus, triangularis.

SIERRA LEONE. Loma Mountains, in high altitude grasslands, Aug. 1945, *Jaeger* 976 (type).

This species is the first representative of sect. *Multipartitae* to be found west of Northern Nigeria. In its narrow folded leaves it resembles *H. mannii* Hook. f. but possesses a much longer spur in which respect it agrees with the East African *H. splendens* Rendle. From both of these species it may be distinguished by the completely sessile receptive part of the stigmas and by the method of pectination of the lateral lobes of the lip. In the species mentioned, and also in the other large-flowered African species of the section, the slender processes arise more or less pinnately from a main portion which is of almost equal width throughout its length. In *H. jaegeri*, on the other hand, the main portion of the lateral lobe is cuneately or almost flabellately widened upwards and the processes arise from this widened part in an almost palmate manner.

Habenaria (§ **Diphyllae**) **trilobulata** *Schltr.* in Engl. Bot. Jahrb. **26,** 332 (1899). *H. quadrifila* Schltr. l.c. **53,** 504 (1915) ; Schltr. ex Mansf. in Fedde, Repert. Spec. Nov. Beih. **68,** t. 33, no. 129 (1932).

On examination of the type gatherings of the above two species I can discover no significant differences between them. In describing *H. quadrifila* Schlechter states that it is closely related to *H. trilobulata* from Mozambique but that the petals are " volkommen verschieden ". His descriptions of these members in the two species are, however, almost identical, this agreement being borne out by the specimens. As Schlechter refers to *H. mosambicensis* Schltr. in the course of his description of *H. quadrifila* it appears that he may have confused his two Mozambique species in his comments referred to above.

H. trilobulata is remarkable for the very unequal lobing of the petals, the filiform anterior lobe being three or four times as long as the rounded posterior lobe, and for the large rostellum which stands well in front of the much shorter anther.

Platycoryne ochrantha (*Schltr.*) *Summerhayes,* comb. nov. *Habenaria ochrantha* Schltr. in Engl. Bot. Jahrb. **53,** 494 (1915).

Liparis rufina (*Ridley*) *Rchb. f. ex Rolfe* in Dyer, Fl. Trop. Afr. **7,** 19 (1897). *L. nyassana* Schltr. in Engl. Bot. Jahrb. **53,** 560 (1915); Schltr. ex Mansf. in Fedde, Repert. Spec. Nov. Beih. **68,** t. 55, no. 218 (1932).

On the examination of the material of the type collection of *L. nyassana* (*Stolz* 1124) in the Kew Herbarium I fail to see any difference between this species and the widely spread *L. rufina* (Ridl.) Rchb. f. ex Rolfe. Schlechter figures the lip as rounded in front with no emargination and with a trilobed basal callus, but I do not find the former in the Kew specimen and I believe the latter to be a misinterpretation of the structure. In a long series of specimens of *L. rufina* the amount of emargination of the front lobe is seen to be quite variable, some lips being almost rounded in front. In all other floral features the specimens agree very well and evidently should be referred to one species.

The species is now known from Sierra Leone eastwards to Uganda and Tanganyika and then around the Congo Forest basin through Northern Rhodesia to Angola. The Nyasaland specimen suggested by Rolfe as belonging to his *L. ruwenzoriensis* appears to be referable to *L. rufina.*

Malaxis stolzii (*Schlechter*) *Summerhayes,* comb. nov. *Microstylis stolzii* Schltr. in Engl. Bot. Jahrb. **53,** 559 (1915).

The above species, which was previously only known from southern Tanganyika Territory, has now been discovered by Mr. E. Milne-Redhead in the extreme west of Northern Rhodesia. The two gatherings agree very well in all essential characters, but the Rhodesian specimens have slightly larger flowers.

Polystachya (§ **Affines**) **acridolens** *Summerhayes,* sp. nov.; a *P. malilaensi* Schltr. sepalis brevioribus latioribusque, labelli ungue breviore; a *P. zambesiaca* Rolfe sepalis angustioribus, petalis lineari-ligulatis, labelli disco fere glabro, ungue longiore; ab utraque floribus acridolentibus satis distinguenda.

Herba epiphytica vel saxicola, parva. *Pseudobulbi* contigui, ovoidei, 1·5 cm. longi, circiter 1 cm. diametro, superne 2–3-foliati, inferne vaginis paucis membranaceis vestiti. *Folia* erecto-patentia, ligulata vel lineari-ligulata, apice rotundata, levissime inaequaliter bilobulata, 5–7 cm. longa, 7–9 mm. lata, viridia. *Inflorescentiae* erectae, simpliciter racemosae, 3·5–7 cm. altae, apice 3–8-florae; pedunculus teres, 2–3 cm. longus, vagina lanceolata acuminata instructus, ut rhachis subdense pubescens; bracteae late ovatae vel ovato-orbiculares, apice subito acuminatae. 4–6 mm. longae, 3 mm. latae. *Flores* erecto-patentes, acridolentes; pedicellus (cum ovario) 6–7 mm. longus. *Sepalum* intermedium lanceolatum, acuminatum, convexum, 7 mm. longum, 2·5–2·75 mm. latum, trinervium; sepala lateralia oblique triangularia, acuminata, margine posteriore 8–9 mm. longa, anteriore 7·5 mm. longa, 5–5·5 mm, lata, basi cum pede columnae adnata mentum subacutum 4·25 mm. longum formantia, quinquenervia; sepala omnia extra sparse pubescentia. *Petala* lineari-ligulata, apice breviter acutata, 5·5–6 mm. longa, 1 mm. lata, uni- vel subbinervia; tepala omnia laete viridia, basi purpureo-tincta. *Labellum* valde recurvatum, ex ungue brevi medio trilobatum, 7 mm. longum, 5 mm. latum; lobi laterales erecti, fere sub-

orbiculares ; lobus intermedius lanceolato-ovatus, acuminatus, 3·5–4 mm. longus, 2·75 mm. latus, leviter ruguloso-bullatus ; discus callo semisphaerioideo ruguloso fere glabro instructus ; labellum album, lobis lateralibus purpureo-maculatis. *Columna* brevis, subteres.

TANGANYIKA TERRITORY. Njombe, Kifunga, near river, 1800 m. alt., coll. Mrs. H. W. D. Pollock ; flowered Amani, Jan. 1944, *Moreau* 492 (type) ; Njombe, Ruhiji River, 1800 m. alt., on rocks, coll. Mrs. H. W. D. Pollock ; flowered Amani, March 1944, *Moreau* 498.

A pretty little species with green and white flowers resembling *P. malilaensis* Schltr. in the very narrow petals and *P. zambesiaca* Rolfe in the general features of the lip. The peculiar acrid smell of the flowers is a striking character from which the specific epithet is derived.

Polystachya (§ **Affines**) **acuminata** *Summerhayes*, sp. nov. ; a *P. malilaensi* Schltr. foliis pro rata latioribus, floribus anisatis, sepalis lateralibus apice longe subulato-acuminatis, petalis ± lanceolatis acutis, labelli lobis lateralibus minoribus differt.

Herba epiphytica, humilis. *Pseudobulbi* ovoidei vel subsphaeroidei, 1–2·5 cm. longi, 5–10 mm. diametro, fusco-virides, nitidi, juventute inferne vaginis 2–3 obtusis ± scariosis instructi, superne 3–4-foliati. *Folia* patentia vel fere recurvata, oblanceolata, oblongo- vel elliptico-lanceolata, sub-acuta sed apice ipso breviter tridentata, infimum quam aliis saepius multo minus, 0·8–8 cm. longa, 5–13 mm. lata, viridia, purpureo-marginata et irregulariter purpureo-notata. *Inflorescentiae* simpliciter racemosae vel rarius pauciramosae, erectae, 6–14 cm. altae, dimidio superiore sublaxe 7–12-florae ; pedunculus 2–6 cm. longus, teres vel leviter compressus, vaginis paucis instructus, ut rhachis breviter pubescens ; bracteae late ovatae, acuminatae, 6–11 mm. longae, 5–7·5 mm. latae, sparse pubescentes. *Flores* ± secundi, adscendentes, anisati ; pedicellus (cum ovario) 5–7 mm. longus. *Sepalum* intermedium lanceolatum, acuminatum, convexum, incurvatum, 8·5–11·5 mm. longum, 1·75–3·25 mm. latum ; sepala lateralia oblique vel subfalcatim triangularia, apice longe subulato-acuminata, 11–15 mm. longa, basi 4–5·5 mm. lata, cum pede columnae adnata mentum obtusum 3–4·5 mm. longum formantia, dorsaliter carinata ; sepala omnia trinervia, sparsiuscule pubescentia, lutescenti-olivaceo-brunnea. *Petala* curvatim lanceolata vel oblanceolata, acuta vel acuminata, 6–7·5 mm. longa, 1·25–2 mm. lata, subbinervia, olivaceo-ochracea. *Labellum* valde recurvatum, ex ungue brevi lato medio breviter trilobatum, 4·5–5 mm. longum, 3·5 mm. latum, pubescens; lobi laterales erecti, rotundato-triangulares, 0·5–0·7 mm. longi ; lobus intermedius valde recurvatus, lanceolato-ovatus, acutus, leviter canaliculatus, 2·75–3·75 mm. longus, 1·5–2·75 mm. latus ; labellum album, lobi laterales intus intense purpurei, lobus intermedius subtus purpureo-marginatus. *Columna* brevis, lata ; anthera semi-sphaerica.

TANGANYIKA TERRITORY. Eastern Usambaras, Ngambo, 7 miles N. of Amani, 900 m. alt., in rain-forest, densely shaded, flowered February-March 1942, *Moreau* 130 ; Western Usambaras, in rain forest, shaded, March 1943, *Moreau* 130 A (type).

A typical member of sect. *Affines* especially characterised by the long-acuminate, almost caudate, solid apices of the lateral sepals, the acute petals and anise-scented flowers.

Polystachya zambesiaca *Rolfe* in Bull. Misc. Inform. Kew, 1895, 192.
P. hislopii Rolfe, l.c. 1914, 375.

On examination of the two type specimens and of other gatherings I am of the opinion that these two are the same. *P. hislopii* was considered by Kraenzlin (Fedde, Repert. Spec. Nov. Beih. **39**, (1926) 86) to be a variety of his *P. lawrenceana*, but this species has stiffer leaves, differently coloured flowers and a much blunter and less curved middle lobe to the lip. For some quite unexplained reason he places *P. lawrenceana* in section *Grandiflorae* whereas *P. zambesiaca* is properly referred to section *Affines*. Both should be placed in the latter section.

Polystachya sectio **Isochiloideae** *Summerhayes* sect. nov.

Plantae epiphyticae vel saxicolae. *Rhizoma* breve repens vel paulo evolutum. *Caules* contigui, saepius erecti, basi in pseudobulbos saepius parvos incrassati, superne graciles et 2–5-phylli. *Folia* saepius ± erecta, linearia vel anguste ligulata. *Inflorescentiae* simpliciter racemosae vel e racemis brevibus paucis compositae, pluri- ad multiflorae ; bracteae parvae vel mediocres, rarius magnae. *Flores* pro genere satis magni, textura teneri, glabri vel pubescentes, labello saepissime pilis clavatis vel capitatis induto.

Species circiter 6 adhuc notae, Africae orientalis indigenae. Species typica sectionis—*P. isochiloides* Summerh.

In a previous contribution in this series (Bull. Misc. Inform. Kew, 1939, 498–9) I suggested that *P. isochiloides* Summerh., *P. shega* Kraenzl. and *P. goetzeana* Kraenzl., which I placed provisionally in sect. *Affines*, should probably form a new section. As a result of extensive collections in Tanganyika Territory by Mr. & Mrs. R. E. Moreau I have recently been enabled to examine a great deal of material belonging to the above or other closely allied species

As a result I am formally describing the new section *Isochiloideae* consisting of the three species mentioned above and three new species which are described in the following pages. There are also gatherings which may prove to belong to further undescribed species of the same affinity, but the material is not adequate for satisfactory description.

The new section evidently lies between sections *Affines* and *Dendrobianthe*, resembling the latter in the slender stems thickened at the base to form pseudobulbs and in the narrow grass-like leaves. The flowers are intermediate in texture between the two sections but the structure more closely resembles that of sect. *Affines*, the lip being distinctly trilobed with usually an acute middle lobe. The bracts are normally long and narrow but in *P. caudata* Summerh. they are very broad in the lower part and thus resemble those in sect. *Affines*. A striking feature, which occurs in all the species but *P. rugosilabia* Summerh., is the presence on the lip of numerous clavate or capitate hairs. Somewhat similar, but usually much shorter, hairs occur in sects. *Affines* and *Dendrobianthe*.

Polystachya (§ **Isochiloideae**) **caudata** *Summerhayes*, sp. nov. ; a *P. isochiloidi* Summerh. foliis paucioribus, bracteis late ovatis vel suborbicularibus apice caudatis, tepalis obtusioribus, labelli lobo intermedio late rotundato undulato, callo minus distincto differt.

Herba epiphytica ; caules approximati, erecti, basi pseudobulbosi, superne graciles, 3–4-foliati, 10–12 cm. alti., 1–2 mm. diametro ; pseudobulbi conico-ovoidei, 5–10 mm. longi, 4–7 mm. diametro. *Folia* suberecta, linearia, apice obtuse et inaequaliter bilobulata, vagina inclusa 13–22 cm. longa, 3–4·5 mm. lata, fusco-viridia. *Inflorescentia* ± erecta, racemosa vel e racemis paucis secundis composita, 7–24 cm. longa ; pedunculus 4–15 cm. longus, vaginis arctis scariosis acutis imbricantibus griseis omnino obtectus ; rami usque ad 4, 1·5–4·5 cm. longi ; rhachis teres, pubescens ; bracteae patentes vel recurvatae, late ovatae vel suborbiculares, apice caudato-acuminatae, 5–11 mm. longae, inferne 5–6 mm. latae, glabrae vel sparsissime pubescentes. *Flores* erecto-patentes, albi vel cremei, labello rubro-notato, fragrantes ; pedicellus cum ovario 5–10 mm. longus. *Sepalum intermedium* lanceolatum vel oblongo-lanceolatum, apice subacutum vel apiculatum, 7·25–9 mm. longum, 2·5–3·25 mm. latum, convexum, subquinquenervium ; sepala lateralia oblique lanceolato-triangularia, acuta vel apiculata, margine superiore (antico) 8·5–12 mm. longa, basi 4–6 mm. lata, cum pede columnae adnata, mentum rotundatum 3·5–5 mm. longum formantia ; sepala basi sparse pubescente excepta glabra. *Petala* oblanceolata vel subspathulato-oblanceolata, acuta vel subacuta, 6·5–7·75 mm. longa, 1·5–2 mm. lata, trinervia. *Labellum* valde recurvatum, ex ungue brevi medio trilobatum, 8–10·5 mm. longum, 6·25–7 mm. latum (explanatum) ; lobus intermedius recurvatus, quadrato-suborbicularis vel late semi-ellipticus, rotundatus, 3–3·75 mm. longus, 2·75–4 mm. latus, levissime undulatus ; lobi laterales erecti, triangulari-ovati, obtusi vel rotundati, margine antico 2·3–2·6 mm. longi ; discus callo longitudinali humili instructus, ut ungue et basibus loborum clavato- vel capitato-pilosus. *Columna* porrecta, semiteres, 2·75 mm. alta.

TANGANYIKA TERRITORY. West Usambara Mts., Bungu, fl. Amani, Sept. 1942, *Moreau* 166 (type) ; East Usambara Mts., Monga Highforest, near Amani, 1000 m. alt., Nov. 1916, *Zimmermann* ; Gombora, 15 miles N. of Amani, Dec. 1941, *Moreau* 782.

This species, which is clearly a close relative of *P. isochiloides* Summerh., may be most easily distinguished from the other species of the section by the remarkable bracts which from a very broad base are suddenly narrowed to form a long tail-like apex. The branches of the inflorescence, as in *P. tessellata* Lindl. and other species, are all turned to one side of the main axis. The peduncle is covered with closely fitting scarious sheaths, while the bracts subtending the branch racemes are similar and partly cover the main rhachis. The clavate or subcapitate hairs, so characteristic of the section, cover thickly the lip callus and claw and occur less thickly on the bases and centres of the lobes.

Polystachya (**§ Isochiloideae**) **rugosilabia** *Summerhayes*, sp. nov. ; affinis *P. goetzeanae* Kraenzl., a qua floribus paulo minoribus, sepalo intermedio 3–5- nec 7-nervio, petalis apice acuminatis, labelli lobis lateralibus multo majoribus ab intermedio divergentibus, lobo intermedio basi angustato valde ruguloso medio 2- 3-cristato cristis crenulatis satis distinguitur.

Herba epiphytica ; caules e rhizomate repenti exorientes, approximati, erecti, basi pseudobulbosi, superne 3–4-foliati, 5–6 cm. alti ; pseudobulbi ovoidei vel conico-ovoidei, 5–7 mm. alti, 4–5 mm. diametro. *Folia* erecta, infimum ad vaginam truncatam redactum, superiora linearia, apice obtusa, breviter et inaequaliter bilobulata, 9–21 cm. longa (vagina inclusa), 3–5 mm. lata. *Inflorescentia* quam folia multo brevior, 5–7 cm. longa, superne pauciflora ; pedunculus 3–5 cm. longus, vaginis 2–3 spathaceis 2–4 cm. longis linearibus acutis imbricantibus suprema flores superante instructus ; rhachis leviter flexuosa, breviter pubescens ; bracteae ovatae, subito et longe acuminatae, parvae, 1·5–2 mm. longae. *Flores* 1–2, ± patentes, glabri, fragrantes ; pedicellus cum ovario 5–7 mm. longus. *Sepalum* intermedium lanceolatum, leviter acuminatum, 9·5–11·5 mm. longum, 3·75–4·5 mm. latum, 3–5-nervium ; sepala lateralia oblique triangularia, acuminata, margine superiore (antico) 12·5–13·5 mm. longa, basi 7–9 mm. lata, cum pede columnae adnata mentum incurvatum rotundato-conicum apice bilobatum 6·5–7·5 mm. longum formantia, *Petala* e basi angusta lanceolata, acuminata, 10–10·5 mm. longa, circiter 3 mm. lata, trinervia ; sepala et petala alba, pallide purpureo-marginata. *Labellum* satis recurvatum, ex ungue breviusculo medio trilobatum, totum 12 mm. longum, explanatum 9·5–11 mm. latum ; lobus intermedius recurvatus, ex isthmo distincto suborbicularis vel fere transverse ellipticus, apice breviter acuminatus vel apiculatus, 6–7 mm. longus, 5·5–8·5 mm. latus, marginibus leviter undulatis, valde rugulosus, medio 2–3-cristatus, cristis brevibus humilibus crenulatis ; lobi laterales erecti, ab intermedio fere angulo recto sejuncti, semiovati, apice rotundati, margine antico 4–5 mm. longi, praesertim antice rugulosi ; discus callo longitudinali pulvinari humili instructus ; labellum album, disco viridi. *Columna* 4 mm. alta, semi-teres, sensim angustata ; anthera hemisphaerica, antice truncata ; rostellum haud productum, leviter emarginatum, fovea stigmatica quadrata.

TANGANYIKA TERRITORY. Nguru Mountains, 750–900 m. alt., in dense shade, flowered Amani, Aug. 1942 and Sept. 1944, *Moreau* 343. " Leaves dark green. Flower mainly white with pinkish-mauve edges to sepals and petals ; disc of lip lime-green ; fragrant ".

This attractive species is evidently allied to *P. goetzeana* Kraenzl. which it closely resembles in general appearance. It differs chiefly from this species, and indeed from the other species of the section, in the markedly rugulose lobes of the lip and the apparent absence from this organ of the clavate hairs so characteristic of the other species. In the small basal pseudobulbs, the long narrow leaves and the comparatively thin-textured flowers *P. rugosilabia* agrees with the remainder of the section.

Polystachya (§ **Isochiloideae**) **vaginata** *Summerhayes*, sp. nov., affinis *P. shega* Kraenzl., a qua pedunculo rhachidi longiore vel aequilongo ut rhachidi vaginis arctis fere omnino obtecto, florum colore satis distinguenda.

Herba epiphytica ; caules erecti, approximati, pseudobulbosi, anguste cylindrico-conici, 1–3 cm. alti, 5–10 mm. diametro, vaginis paucis acutis scariosis vestiti, superne 2–3-foliati. *Folia* suberecta, ligulato-linearia, apice rotundata, obtuse et aequaliter vel paulo inaequaliter bilobulata, 5–25 cm. longa, 3–8 mm. lata. *Inflorescentiae* saepius folios superantes, simpliciter racemosae vel e racemis pluribus compositae, 7–48 cm. altae ; pedunculus 5–23 cm. longus, ut rhachis vaginis arctis ancipitibis acutis fere omnino obtectus ; rami usque ad 7, secundi, 1–4 cm. longi, 2–5-flori, rhachidi nuda densiuscule pubescente ; bracteae lanceolatae, acuminatae, 3–7 mm. longae. *Flores* erecto-patentes, suaveolentes ; pedicellus cum ovario 5–10 mm. longus, dense pubescens. *Sepalum* intermedium leviter incurvatum, lanceolatum vel oblongo-lanceolatum, acutum, 6·5–9·5 mm. longum, 2–4·25 mm. latum, tri- vel subquinquenervium ; sepala lateralia oblique et anguste triangularia, acuminata, margine superiore 8·5–11·5 mm. longa, basi 5–5·5 mm. lata, cum pede columnae adnata, mentum incurvatum cylindrico-conicum rotundatum 3·5–4·5 mm. longum formantia ; sepala omnia extra sparsiuscule pubescentia. *Petala* oblique oblanceolata, acuta, 6–8·5 mm. longa, 1·5–2 mm. lata, trinervia. *Labellum* recurvatum, ex ungue cuneato dilatatum, medio vel supra medium trilobatum, 7·5–9·25 mm. longum, explanatum 5·25–6 mm. latum ; lobus intermedius recurvatus, ovatus vel late ovatus, acuminato-apiculatus, 2·5–4 mm. longus, 3–3·25 mm. latus, marginibus undulatis, medio ± dense clavato-pilosus ; lobi laterales erecti, rotundato-triangulares, margine antico 1–1·5 mm. longo, antice clavato-pilosi ; discus callo parvo humili instructus. *Columna* porrecta, semiteres, 2·5 mm. alta; anthera hemisphaerica, antice haud producta ; fovea stigmatica suborbicularis.

TANGANYIKA TERRITORY. Ufiome Mt., S. of Lake Manyara, south side, 1800 m. alt., at forest edge, coll. R. E. Moreau, fl. Amani, Aug. 1943, *Moreau* 314 (type), " Sepals light brown, petals and labellum yellow "; Tarosero-Burko ridge, 40 miles W. of Mt. Meru, north side, 1500 m. alt., Feb. 1943, coll. H. F. I. Elliott, fl. Amani, *Moreau* 455, " Flower very pale green with white labellum "; Lolaikamaishi Hill, 28 miles S. of Ngasumet (i.e. 100 miles S. of Moshi), 1140 m. alt., on single tree in thorn scrub, coll. Page-Jones, fl. Amani, Aug. 1943, *Moreau* 561, " Sepals lime-green with back midrib and apex maroon. Petals green. Labellum yellowish-white ".

This species is evidently very closely allied to *P. shega* Kraenzl. It has, however, a relatively larger inflorescence with the peduncle and rhachis covered with closely imbricating greyish sheaths, the leaves are a little broader and usually only 2 in number, while there are no red markings on the lip. It appears to be widely distributed in central Tanganyika Territory.

Polystachya (§ **Dendrobianthe**) **bequaertii** *Summerhayes*, sp. nov. ; a *P. tayloriana* Rendle inflorescentiae ramis multo longioribus, floribus laxioribus, labello basi magis angustato fere breviter unguiculato superne obscure trilobato pilis longioribus instructo satis distinguenda.

Herba terrestris vel rupicola ; caules approximati, erecti, basi pseudobulbosi, superne graciles, sub anthesi fere vel omnino aphylli, 15–50 cm. alti, 1–2 mm. diametro, vaginis 6–9 arctissimis breviter imbricatis omnino obtecti ; pseudobulbi conico-ovoidei, 1–2 cm. longi, 0·5–1 cm. diametro. *Folium* (solum vidi) lineare, conduplicatum, circiter 8 cm. longum, 4 mm. latum. *Inflorescentia* terminalis, simplex vel e racemis usque ad 4 ± secundis composita ; rami singuli vel gemini, ex axi arcuatim divergentes, graciles, usque ad 7 cm. longi, per totam longitudinem floriferi, usque ad 20-flori ; rhachis leviter fractiflexa, teres vel obtuse angulata, fere glabra ; bracteae 2–4 mm. distantes, erecto-patentes vel fere patentes, late triangulares, acuminatae, 1–2·5 mm. longae. *Flores* suberecti, purpureo-rubri (fide collect.) ; pedicellus cum ovario gracillimus, 1–2 cm. longus, omnino glaber. *Sepalum intermedium* oblongo-lanceolatum, apice rotundatum leviter emarginatum, convexum, tri- vel subquinquenervium, 6–8 mm. longum, 2·75–3·5 mm. latum ; sepala lateralia oblique et leviter curvatim triangularia, apice subacuta, margine superiore (antico) 7·5–9 mm. longa, basi 6–6·5 mm. lata, quinquenervia, cum pede columnae adnata, mentum rotundatum arcuatum 5·5–6 mm. longum formantia. *Petala* elliptico- vel subspathulato-ligulata, apice rotundata, basi angustata, 6–7·5 mm. longa, trinervia ; tepala omnia textura tenuiora, glaberrima. *Labellum* valde recurvatum, ex ungue brevi dilatatum, supra medium obscure trilobatum, totum 6·75–8 mm. longum, medio 3·5–4 mm. latum (explanatum) ; lobus intermedius quadrato-suborbicularis, apice recurvatus apiculatus ; lobi laterales erecti, late rotundati, ex intermedio sinu indistincto sejuncti ; discus callo longitudinali humili densissime clavato-piloso instructus ; lobi marginibus exceptis pilis longioribus apice clavatis modice obtecti. *Columna* porrecta, semiteres, superne subalata, 3·5–4 mm. alta ; androclinium leviter excavatum ; anthera hemisphaerica, leviter cristata ; pollinia quadrato-sphaeroidea, 0·5 mm. diametro, stipite brevi lato, viscidio lunato ; rostellum vix productum ; fovea stigmatica transverse oblonga.

SIERRA LEONE. Loma Mts., high altitude grasslands, terrestrial in moss carpet, Nov. 1944, *Jaeger* 660.

LIBERIA. Mt. Mpaka Fossa, near Kolahun, at summit, 588 m. alt., growing on bare rocks, flowers purple-red, Jan. 1944, *Bequaert* 40 (type) ; Ballawallah, between Kailahun and Bolahun, on rocks, Feb. 1944, *Bequaert* 70.

The species is especially interesting because it shows the close affinity between the two sections *Dendrobianthe* and *Isochiloideae*. In its precocious habit and glabrous delicate flowers *P. bequaertii* agrees with the former section but the lip is obscurely trilobed just above the middle and is definitely narrowed at the base forming an indistinct claw, in both respects approaching sect. *Isochiloideae*. The laxer inflorescence branches separate it at once from all other species of *Dendrobianthe* and in this character also the affinity with the other section is indicated.

The occurrence of a species of either section in West Africa is of considerable interest as they are both only known from the eastern and southern tropical parts of the continent. This discovery is yet another indication of our ignorance of the African flora.

Eulophia livingstoniana (*Rchb.f.*) *Summerhayes*, comb. nov. *Lissochilus livingstonianus* Rchb. f. Otia Bot. Hamburg. 114 (1881).

The epithet *livingstonianus* is the earliest of those proposed for species of this group of Eulophias and it therefore seems advisable to make the combination for practical purposes. It is probable that several of the other allied species will prove to be conspecific with the above.

Eulophia pyrophila (*Rchb.f.*) *Summerhayes*, comb. nov. *Lissochilus pyrophilus* Rchb. f. Otia Bot. Hamburg. 65 (1878).

Eulophia caloptera (*Rchb.f.*) *Summerhayes*, comb. nov. *Lissochilus calopterus* Rchb. f. in Bonplandia, **3,** 218 (1855).

This species may be distinguished from its nearest relatives by the narrow rolled-up leaves which have a rush-like appearance. It has so far only been recorded from the coastal regions of Mozambique and Tanganyika Territory. Several of the specimens cited under this species by Rolfe in the Flora of Tropical Africa (Vol. 7, pp. 93–94) belong to other species.

Angraecum humblotii (*Finet*) *Summerhayes*, comb. nov. *Macroplectrum humblotii* Finet in Mém. Soc. Bot. France, **9,** 22, t. IV, fig. 1–9 (1907). *Angraecum humblotianum* Schltr. in Beih. Bot. Centralbl. **33,** ii, 434 (1915). *A. finetianum* Schltr. l.c. **36,** ii, 158 (1918). *A. abietinum* Schltr. in Fedde, Repert. Spec. Nov. Beih. **33,** 313 (1925).

When Schlechter transferred Finet's *Macroplectrum humblotii* to the genus *Angraecum* he proposed a new epithet *humblotianum* in view of the existence of *Angraecum humblotii* Rchb. f.

Examination of the place of publication of this latter name shows, however, that it is mentioned in notes following the description of *Aëranthus leonii* Rchb. f. merely as a synonym of this. Reichenbach explains that the name had been given to Humblot provisionally for a plant which was exhibited at the Paris Exhibition of May 1885. Reports in contemporaneous French periodicals (Rev. Hortic. **57,** 282 : 1885 ; Journ. Hortic. France, sér. iii. **7,** 190 : 1885) of the plants shown at the Exhibition do not mention the name *Angraecum humblotii* but instead *A. leonii*, the alteration no doubt having been conveyed by Reichenbach to Humblot while the exhibition was in progress. The name *Angraecum humblotii* Rchb. f. is therefore merely proposed in synonymy and is not validly published. Consequently there was no need for Schlechter to provide an alternative epithet for Finet's species and the epithet *humblotii* is the correct one for this species.

I am therefore making the correct combination in the genus *Angraecum* for Finet's plant (*Humblot* 670) and am citing all the other synonyms of which I am aware.

Diaphananthe bidens (*Swartz*) *Schlechter*, Die Orchideen, 593 (1914). *D. trigonopetala* Schltr. in Orchis, **8,** 136, t. 4, fig. 25–32 (1914).

By an oversight I omitted *D. trigonopetala* from my treatment of the genus in a recent number of this series (Bot. Mus. Leafl. Harv. Univ. **12,** 95–111 : 1945), neither does the species appear in Schlechter's revision of the genus (Beih. Bot. Centralbl. **36,** abt. 2, 95–101 : 1918).

An examination of the excellent illustrations and of Schlechter's description shows without doubt that his species is merely another variant of the widely spread *D. bidens*. All the differential characters he mentions can be found in specimens of *D. bidens* either singly or combined in different manners so as to produce all possible gradations.

REVIEW.

Plant life of the Pacific World.*—The attack by Japan, in December 1941, on United States, British, and Dutch territories in the northern Pacific naturally increased the demand for information regarding Pacific lands and especially those exposed to the direct shocks of war. The American and Australasian governments published a number of pocket-books primarily for the use of members of their forces engaged in the Pacific area and dealing entirely or in part with plant-life. Prof. E. D. Merrill is responsible for " The Plant Life of the Pacific World " issued in 1945 as a part of The Infantry Journal and also published, as one of The Pacific World Series, under the auspices of The American Committee for International Wild Life Protection. In the editorial Foreword the work is termed an " unusual book," and unfortunately the phrase is justified, for biology would be much better served than it is were books of this model very usual. It is not a text book of botany, or of any particular branch of botany, but naturally pays special attention to the ecological and economic aspects. One may perhaps criticize the title relative to the contents, since the book is almost entirely concerned with the northern, and especially the north-western, Pacific, indeed, very largely with the Malay Archipelago in the broadest sense. The only index mention of New Zealand, for example, is to a single bibliographical reference, and Australia is similarly only quoted in bibliography.

The variety of topics considered must include some which would arouse the interest of any layman of average ability and education. Plants of the seashore, the mangrove forest, secondary forests and open grasslands, the primary forest, and jungle foods, are some of the chapter headings. The professional botanist, knowing Prof. Merrill's vast knowledge and wide experience of Pacific botany, will turn with interest to the two chapters dealing with plant distribution in Malaysia and Polynesia respectively. He will also value the adequate bibliography.

The book is illustrated by more than 250 black-and-white drawings, mostly of plant species important because of their ecological occurrences or economic values.

W. B. TURRILL.

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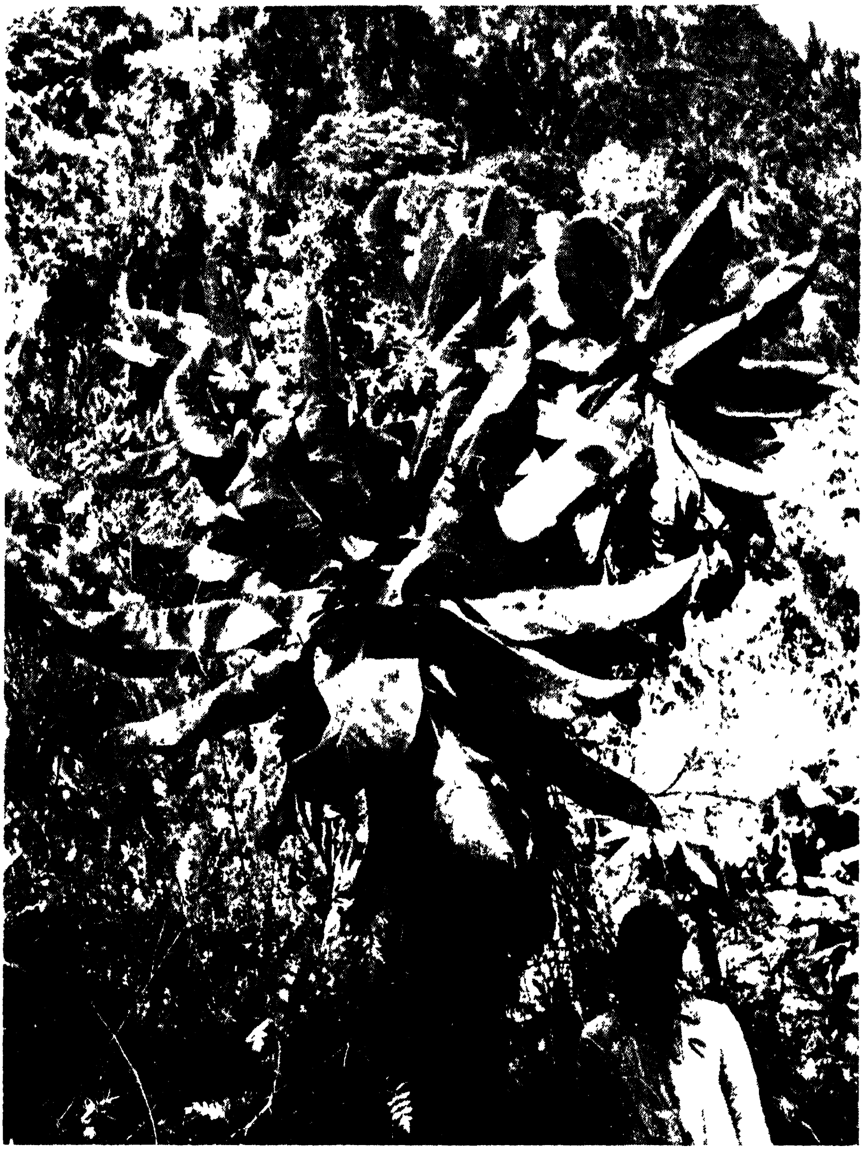
* By E. D. Merrill : The Macmillan Company, New York, second printing 1946, 16/-.

PLATE 5



Senecio meruensis (Greenway 7802) at 10,300 ft. on Mt. Meru. *Photo*—P. J. Greenway.

AN ARBORESCENT SENECIO FROM MT. MERU: S. MERUENSIS SP. NOV.

A. D. COTTON AND R. A. BLAKELOCK.

The existence of arborescent Senecios on various smaller summits in British East Africa was discussed in a paper in the *Kew Bulletin* in 1937 (1). Since then adequate material has been received of the single species known to occur on one of the mountains—Mt. Meru, which is an isolated volcanic summit, 14,902 ft. in altitude, about 40 miles west of Kilimanjaro.

Though this species has never been described, its presence on Mt. Meru has been known for over forty years. Mildbraed cites a specimen collected by Uhlig as follows : " Südseite, auf grasigen Stellen, in der Ericaregion, ca. 3400 m. ü. M. Waldform, wenig behaart. (Altes Blatt, November 1901—Uhlig No. 685) " ; he refers it to *S. kilimanjari* Mildbr.(2).

It was next collected by the late B. D. Burtt, who in 1932 ascended the west side of the mountain and sent two herbarium specimens and a short length of trunk to Kew. Mr. H. F. J. Elliot, an administrative officer, collected a specimen in 1943.

Recently further material, including herbarium material of the flowers, leaves, a young plant, pickled material of the flowers, and wood specimens, as well as photographs, has been provided by Mr. P. J. Greenway, of the Agricultural Research Institute, Amani.

From the field notes of the last three collectors the following account of the distribution and ecology of the plant, which is described below as *S. meruensis* sp. nov., can be given.

The species occurs between 9,500 and 11,500 ft. on the south, south-east and west aspects of the mountain. On the west side of the cone it grows very locally in deep saturated ravines with precipitous sides, amongst *Philippia* heavily laden with moss, with *Erica arborea* on barer patches and *Alchemilla* as the dominant herb (9,500–10,500 ft., *Burtt* 4050). On the north wall and lava flow in the great crater, *S. meruensis* is found on moss and humus collecting on the new lava flow, among *Philippia* and *Erica arborea,* also on precipitous cliffs on mossy ledges. Here the trees are locally scattered, not dominating the vegetation as in the Virunga Mts. (10,500–11,500 ft., *Burtt* 4051).

Mr. Greenway reports, however, that the species may be locally dominant in seepage zones with *Hagenia*, *Ericaceae*, *Pygeum*, *Conyza*, *Hypericum lanceolatum* and *Helichrysum fruticosum* at 10,300 ft. on the south slope of the mountain (*see* plate).

Mr. Elliot's specimen was collected in stunted tree-heath, at about 10,000 ft., on the S.E. ridge.

The description is as follows :—

S. meruensis *Cotton et Blakelock,* sp. nov. : a *S. kilimanjari* Mildbr. foliis oblongo-ellipticis, tenuioribus, infra minus dense crispato-pilosis, disci floribus paucioribus differt.

Arbor usque 8 m. alta. *Truncus* simplex vel ramosus, apice foliis marcescentibus vestitus. *Folia* tenuia vel subcrassa, oblongo-elliptica, dentata, dentibus usque 3 mm. longis; lamina apice obtusa vel subrotundata, basi subrotundata vel in foliis minoribus in petiolum

sensim attenuata, 10.5–65 cm. longa, 5.2–26 cm. lata, supra glabrescens vel sparse pilosa, infra sparse vel modice dense crispato-pilosa, margine ± elevata et tomentosa, costa praecipue basin versus pilosa demum glabrescente, nervis lateralibus angulo acuto vel obtuso ortis 1–4.5 cm. inter se distantibus ; petiolus alatus, 6–20 cm. longus, angustissima parte c. 1–4 cm. latus, basi latior, infra costa longe pilosa, supra basin dense longeque pilosus. (In plantis juvenilibus folia oblongo-elliptica, obtusa, usque 24 cm. longa, 11.5 cm. lata, infra sparse crispato-pilosa, costa pilosa ; petiolus haud alatus, pilosus, usque 18 cm. longus, 5 mm. latus.) *Inflorescentia* c. 1 m. longa ; axis ramulique lanati ; bracteae foliosae, supra glabrescentes vel sparse pilosae, infra sparse vel modice dense crispato-pilosae, basi late alatae. *Capitula* subcampanulata, 1–1.5 cm. longa, c. 1 cm. lata (ligulis excl.). *Involucri bracteae* lanatae vel glabrescentes, 3-seriatae ; exteriores 1-seriatae, 7–14, lineares, 5–11 mm. longae, 1 mm. latae ; interiores 2-seriatae, 12–14, oblongo-lanceolatae, acutae, 10–13 mm. longae, 2–6 mm. latae. *Flores radii* 7 (?)—17, longe ligulati, pallide flavi ; ligula 15–20 mm. longa, 2–3.5 mm. lata, tubo 5–7.5 mm. longo. *Flores disci* 44–65, corolla 8–10 mm. longa. *Ovaria* glabra, striata.

TANGANYIKA. Mt. Meru, 9,500–10,500 ft., west side of cone, 28.9.1932, *B. D. Burtt* 4050 (type), 4004 ; 10,500–11,500 ft. or more, on north wall and lava flow in the great crater, 5.10.1932, *Burtt* 4051 ; c. 10,000 ft., S.E. ridge, 1943, *H. F. J. Elliot* 9770 (Herb. Amani) ; 10,300 ft., S. slope, 23.6.1946, *P. J. Greenway* 7801, 7802.

S. meruensis, as might be expected, is most closely related to the Kilimanjaro series of species. It differs from *S. johnstoni* in the lack of the cordate leaf-base and in the larger capitula, and from *S. kilimanjari* in its more slender habit, which is correlated no doubt with the fact that it grows with tall shrubs, whereas *S. kilimanjari* occurs in the open. Thus we find that *S. meruensis* may attain a height of 8 m. against the 5 m. of *S. kilimanjari* ; its leaves moreover are thinner and less hairy, there is less marcescent foliage and the capitula are smaller. In many respects, therefore, it is intermediate between *S. johnstoni* and *S. kilimanjari.*

As to species on other mountains, *S. meruensis* is distinguished from all the Cherangani and Mt. Elgon species (with which it might be expected to have affinity) by the raised tomentose margin on the underside of the leaf.

The field notes add some further details. The trunk is bare below, and with up to 20 dead leaves remaining under the living ones, often with the old panicle persisting among the dead leaves. The trees are branched up to eight times, although unbranched flowering specimens were often seen. One old tree was observed bearing 20–30 flower heads. The leaves are described as bright green, the involucral bracts as tinged with red, and the flowers as lemon yellow. Flowers have been collected in June and September.

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COLPOMENIA SINUOSA.

C. I. DICKINSON.

Soren Lund has recently published a very clear account of an alga which appeared in the English Channel at the beginning of the century and passed under the name of *Colpomenia sinuosa* (Roth) Derb. et Sol.

Briefly, the facts are that *C. sinuosa*, common in the Mediterranean, was known only as far north as Cadiz until 1905, when attention was drawn to what was thought to be the same species causing destruction in the oyster beds at Vannes in Brittany. It spread rapidly in both directions along the coast of France and also along the English side of the Channel. Since then it has been extending northwards and is now reported by Lund in Denmark.

Sauvageau (1927) pointed out that the western European alga differed from the Mediterranean one, but that it resembled a *Colpomenia* found on the Pacific Coast of North America as far north as Alaska. He treated it as var. *peregrina* of *C. sinuosa*, but suggested that it might even merit specific rank.

Lund has drawn up a description which he says is based principally on Sauvageau's work, and he makes a species of var. *peregrina* in the title of his paper, although nothing is said about this in the text. Lund draws attention to some discrepancy in descriptions of the plurilocular sporangia of the cold water form. According to his own observations most of the sporangia had 4 or 5 tiers of cells while Cotton (1908) figured sporangia with 7 tiers. Lund has, however, omitted mention of one paper which may have some bearing on the problem.

Kunieda and Suto (1938), in giving an account of the life-history of *Colpomenia* found in the neighbourhood of Misaki, describe three types of sporangia ; dioecious plants of the spring producing what they suppose to be male and female gametangia, and autumn plants producing sporangia which liberate zoospores. All three reproductive bodies were different and what were supposedly the female gametangia had 4 tiers.

Some very fine specimens of *Colpomenia* washed up near Portland in May, 1946, were collected by H. K. Airy-Shaw. They appeared to be the typical Channel form, having a thin and more or less globose thallus. One measured about 25 cms. at its greatest width, which is a good deal larger than specimens usually found on the English coast. Unfortunately the specimens were put into rather strong formalin and when examined were not in very good condition, but they did show sporangia mostly with 4 or 5 series of cells. This led to an examination of herbarium material, which showed that a plant collected in September, 1907, at Torquay corresponds to that figured by Cotton, while a specimen collected at Weymouth in April, 1908, has sporangia of the 4 series type. There is very little fertile material in the Kew herbarium, but the result of examining these few specimens suggests that it might be worth while making careful comparison with fresh specimens found at different times of the year with a view to establishing whether or not in this country the plants are of two different kinds.

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REVIEW

Vegetable Cultivation in Hong Kong*.—This book is in many ways a remarkable production. It was largely written " during a sojourn of 43 months in the Civilian Internment Camp at Stanley," as a second edition of a work that " was prepared in a hurry during the hot summer of 1941." Possibly the " ample time " referred to in the Introduction accounts for some of the undoubted merits of both the text and the drawings.

The first seventy pages deal with matters of general horticultural interest, which are for the most part treated in an up-to-date and very readable manner. The rest of the book gives details regarding the garden crops grown in Hong Kong, under the main headings : salads, spinaches, cabbages, onions and other greens, beans and peas, gourds and cucumbers, fruits and seeds, roots and tubers, and market vegetables. In addition to vegetables well-known in Britain a number are described which might be tried here in the warmer parts of the country. The information given under the species is often unusual and is therefore the more valuable. One concludes that the writer " knows his plants " at first-hand.

W. B. TURRILL.

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* By G. A. C. Herklots. Printed by The South China Morning Post, Ltd., Hong Kong, April 1947, price $12.00.

REVIEW.

The genus Paeonia *.—Perhaps no better proof of the close and happy relationships existing between botany and horticulture can be found than this volume of Col. Stern's study of the paeonies. On any standard it is a first class production : in the present times of austerity it can only be described as sumptuous. Miss Snelling's beautiful coloured illustrations and the excellent fount naturally attract immediate attention. The only complaint that can be made regarding production is that some of the paintings might with advantage have been so centred as to leave a somewhat wider margin at the top.

Col. Stern recognizes 33 species and 14 varieties, which are divided into three sections, two of which have two subsections each. There is a key to the sections and subsections and another to the species and varieties. References, synonyms, a description, the known distribution, and (usually) a discussion are given for every one of the species and varieties. Text figures of leaves or carpels are sometimes provided. There is a chapter, chronologically arranged, summarizing the history of paeony literature, and another on paeony species in cultivation. An appendix lists the species and synonyms and a second gives the bibliography. There is a very short index.

The practical taxonomic value of this monographic study is bound to be very great, the more so that the treatment of species appears well-balanced, with neither over-splitting nor over-lumping. It is interesting to note how the taxonomic treatment as based on gross morphological and chromosome characters is reflected in the geographical ranges of both sections and species. The genus is limited to the Northern Hemisphere. The section *Moutan*, consisting of species with woody stems, is limited to eastern Asia ; the section *Onaepia* contains herbaceous species confined to western North America ; the section *Paeon* is composed of herbaceous species found in Europe, North Africa and Asia, from Spain to Japan. The two North American species (*P. brownii* and *P. californica*) of the section *Onaepia* and the shrubby species (" tree paeonies ") of the section *Moutan* are all diploid (2 n = 10). With the exception of one, all the species of *Paeonia* in central and eastern Asia of the groups *Lactiflora*, *Mairei*, *Obovata*, and *Anomala* are diploids. In six groups, one of the species is a diploid and the remainder of the species in the group are tetraploids. The diploid and tetraploid species in every group are closely related morphologically and are found in associated geographical areas. In general, the tetraploids are larger and stronger growing plants than the closely related diploid and have much more extensive ranges. It is postulated that diploid species were pushed south in Europe with the oncoming of the Ice Age. They gave rise to tetraploid species which proved better adapted to the post-glacial conditions and spread farther afield than the diploids owing to their greater vigour.

Col. Stern and the Royal Horticultural Society are to be congratulated on this excellent " Study," which is dedicated to the author's wife.

W. B. TURRILL.

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* A Study of the Genus Paeonia, by F. C. Stern, O.B.E., M.C., F.L.S., V.M.H. London : The Royal Horticultural Society, Vincent Square, S.W.1., 1946. Price 3 guineas.

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